APPENDIX D

Burns &McDonnell Transmission Capacity and Availability Memorandum

Burns & McDonnell
SINCE 1898

Date: December 9, 2014

To: Panoche Valley Solar, LLC

From: Hyung Shin, Burns & McDonnell

Subject: Panoche Valley Solar Project
Interconnection Constraints for Westlands CREZ

I, Hyung Shin, Ph.D., Associate Electrical Specialist with Burns & McDonnell (resume attached), conducted an analysis of the existing transmission infrastructure in the Westlands Competitive Renewable Energy Zone (CREZ) area. Specifically, I evaluated the practicability of locating a 247 megawatt (MW) solar facility in the Westlands CREZ area based on available transmission infrastructure. In the area of proposed development, the existing Gates–Gregg 230 kilovolt (kV) and the Gates–McCall transmission lines were considered the most likely Points of Interconnection (POI). Additionally, a new generator tie line connecting directly to the Gates Substation was evaluated.

The technical review indicated that system upgrades would be required for the addition of a 247 MW solar generating facility at any of the potential POI identified. In the vicinity of the Westlands CREZ area there are over 1,500 MW of projects in the California Independent System Operator (ISO) queue waiting for interconnection as shown in Table A. Based on my professional experience, the addition of 247 MW for Q829 (Panoche Valley Solar Project California ISO Queue number) in the area with over 1,500 MW of previously queued projects will likely cause reliability issues in the transmission system, and additional transmission infrastructure will be needed. In addition, interconnection studies to facilitate a change in the currently proposed Panoche Valley Solar (PVS) Project POI from the Moss Landing–Panoche 230 kV transmission line to the Gates–Gregg 230 kV transmission line would be necessary. These studies would take up to two years to complete.

Table A. Project Queue in the Vicinity of Westlands CREZ

Queue	Queue Date	Project Type	Project MW	Point of Interconnection
Q254	8/21/2007	Combined Cycle	600	Gates Substation 230kV bus
Q272	11/1/2007	Solar PV	123	Henrietta Substation 70kV bus
Q633	6/2/2010	Solar PV	18	Gates-Coalinga 70 kV Line #1
Q643W	7/31/2010	Solar PV	100	Gates-Gregg 230 kV and Gates-McCall 230 kV
Q877	4/2/2012	Solar PV	280	Morro-Gates 230kV line
Q954	4/30/2013	Solar PV	150	Gates 230kV Substations (30900 Gates 230)
Q1027	4/30/2014	Battery Storage	20	Gates Substation 230kV
Q1031	4/30/2014	Solar PV	20	Gates Substation 230kV
Q1036	4/30/2014	Solar PV / Battery Storage	203	Mustang Switchyard 230 kV (on Gates-Gregg 230 kV and Gates-McCall 230 kV)
Total			**1,514**	

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An interconnection study was completed by Pacific Gas & Electric Company (PG&E) for Cluster 4 Phase II. This study included the proposed 230 kV switching station that would support the PVS project. The Cluster 4 Phase II Study for the PVS project was completed in November 2012. A change to the POI would nullify the results of that study and a new interconnection study process would need to be initiated using a different POI (e.g. the Gates–Gregg 230 kV transmission line). A revised 230 kV switching station would also lose its queue position. Table A, above includes a list of other projects in the queue in or near the Westlands CREZ[1]. By changing the POI, the Q829 PVS project will have to re-enter the California ISO queue behind the other projects currently in queue.

The California ISO limits interconnection study applications to a brief window; once annually. The next admission window is in April 2015[2] (Cluster 8 Study Process). The Cluster 8 study would likely be completed in December 2016 after which the Generation Interconnection Agreement negotiation can begin.

In order to execute an Interconnection Agreement, the Applicant would need to identify and scope out appropriate network upgrades on the California ISO transmission system[3]. Based on Burns & McDonnell's past experience and the experience of Panoche Valley Solar LLC, this process could take up to a year (i.e., December 2017).

Following the Interconnection Agreement process and identification of network upgrades, the Utility (in this case, PG&E) would be responsible for preparing an Environmental Assessment and performing preliminary engineering in support of a Notice of Construction (NOC) filing, application for a Permit to Construct (PTC) or a Certificate of Public Convenience and Necessity (CPCN). Depending on the complexity of the upgrades, this process could take 6-18 months (the best case scenario would result in the study being completed between June and December 2018). The utility would communicate with the CPUC in the 3-6 months prior to filing the NOC, PTC or CPCN to ensure that the application is as complete as possible. After the utility files the PTC or CPCN application with the CPUC, a review period of approximately 12-18 months is required[4] for the CPUC to review the application and complete CEQA and NEPA documents as required. If Notice of Construction is filed, the process from preparation to effectiveness would take approximately 6 months.[5]

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[1] The California ISO Generator Interconnection Queue is available here: http://www.caiso.com/planning/Pages/GeneratorInterconnection/Default.aspx .

[2] Generator Interconnection and Deliverability Allocation Procedures Cluster Process Summary available here: http://www.caiso.com/planning/Pages/GeneratorInterconnection/GeneratorInterconnectionApplicationProcess/Default.aspx

[3] This would not take into account upgrades or impacts to non-California ISO infrastructure.

[4] The CPUC timeframes are indicated on their website, available here: http://www.cpuc.ca.gov/NR/rdonlyres/A54AA9F9-581A-450A-9E90-96BEBC5919CB/0/CPCNwithpuclogo.doc

[5] A Notice of Construction would be filed in accordance with GO 131-D and would be allowable if the only interconnection upgrades necessary to support the project included: replacement of existing power line facilities or supporting structures with equivalent facilities or structures; minor relocation of existing power line facilities up to 2,000 feet in length, or the intersecting of additional support structures between existing support structures; the conversion of existing overhead lines to underground; placing of new or additional conductors, insulators, or their accessories on supporting structures already built; the power lines or substations to be relocated or constructed undergo environmental review pursuant to CEQA as part of a larger project, and the final CEQA document finds no significant unavoidable environmental impacts caused by the proposed line or substation; power line facilities or substations to be located in an existing franchise, road-widening setback easement, or

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However, it is likely that the project would require a PTC or CPCN rather than an Advice Letter (if the project is proposed for the Westlands Alternative Site) due to the potential requirement for transmission line upgrades. Specific network upgrades have not yet been identified, but our analysis assumes conservatively, that a PTC or CPCN would be required. This conservative timeframe is supported by a review of publically available information, including a Notice of Preparation (NOP) for the Westlands Solar Park (referenced in a letter sent from PVS to the Corps on 11/25/14) which focuses on planning energy generation infrastructure in the Westlands CREZ area. The Westlands Solar Park NOP indicates that three transmission line upgrades would be required to support interconnection of that project. The required transmission line upgrades would entail construction of approximately 121 miles of new transmission line for the Henrietta to Gates Transmission Corridor[6] (11 miles), the Westlands Transmission Corridor[7] (87 miles), and the Helm to Gregg Transmission Corridor[8] (23 miles). The construction of new transmission lines would result in the need to apply for a PTC or CPCN rather than a Notice of Construction according to the CPUC's General Order 131(d). General Order 131(d)[9].

Other environmental permits (e.g. federal or state Incidental Take Permits) would likely require a minimum of one year from completion of the environmental assessment and preliminary engineering to issuance. Assuming a best case scenario, permitting would likely be completed between June and December 2019, assuming there are no permit issues or challenges to the permit.

The utility would then construct the project, which would take between 1-5 years, depending on size and complexity. Assuming a (best case) construction schedule of approximately 12 months, this process would result in a project in service by mid-2020. However, as demonstrated in the Transmission Projects List from the CPUC website[10], projects of similar magnitude generally take much longer between the date of commission approval and the in service date projected. Table B, below depicts a summary of the timeframes associated with the California ISO and CPUC processes.

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public utility easement; or in a utility corridor designated, precisely mapped and officially adopted pursuant to law by federal, state, or local agencies for which a final Negative Declaration or EIR finds no significant unavoidable environmental impacts; or the construction would be statutorily or categorically exempt pursuant to Section 15260 et seq. of the Guidelines adopted to implement the CBQA, 14 Code of California Regulations 8 15000 et seq. (CEQA Guidelines).

[6] The full buildout of WSP solar development will require transmission upgrades to convey the generated power to the Gates Substation. The planned upgrades would involve the construction of a new 230-kV transmission line running parallel to the existing Henrietta-Gates corridor, commencing from a new substation planned for construction inside the north WSP boundary, and running southwestward for a distance of about 11 miles to the Gates Substation on Jayne Avenue near I-5.

[7] The full buildout of the WSP plan area would require the addition of transmission capacity to the existing 500-kV Central California Transmission Corridor along I-5. This would involve the construction of a 500-kV transmission line running generally parallel to the existing transmission corridor from the Gates Substation north for a distance of about 87 miles to the Los Banos Substation.

[8] This new transmission corridor would branch off the planned Westlands Transmission Corridor at the Helm Substation near the City of San Joaquin and head northward across the San Joaquin River, and then eastward to the Gregg Substation located north of Fresno and east of State Route 99.

[9] It is available to review here: http://docs.cpuc.ca.gov/PUBLISHED/Graphics/589.PDF

[10] Available here: http://www.cpuc.ca.gov/NR/rdonlyres/3ED667F7-B622-4DB3-A068-6512A0DEC539/0/122909TransmissionProjectTrackingSpreadsheetexternalversion.xls

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Table B. Timeframes to complete California ISO and CPUC Processes

Process	Timeframe to complete	Likely Completion Date[10]
California ISO Interconnection Study	20 months[11]	December 2016
Interconnection Agreement and scope network upgrades	1 year	December 2017[12]
PG&E prepares EA and preliminary engineering	6-18 months	December 2018
CPUC issues CEQA document; other permits issued	12-18 months	December 2019
PG&E constructs project	1-5 years	December 2020

[10] This completion date is an estimate based on Burns & McDonnell's past experience and professional opinion. These dates are subject to change depending on numerous factors and may be extended beyond the timeframes depicted here.

[11] The application window is limited. The next available timeframe to apply would be April 2015.

[12] PVS Phase II Study was completed on 11/5/2012, and Generator Interconnection Agreement was executed on 1/9/2014.

This timeframe would exceed the timeframe for construction stated in the PVS Project objectives. Furthermore, as stated above, the new Gates-Gregg 230 kV transmission line is not expected to be in service until 2022, which (if utilized as the POI for the Westlands Alternative Site) would exceed the window for the Renewable Portfolio Standard (RPS) goal of 2020 as stated in the Purpose and Need section of the Environmental Impact Statement for the PVS Project.

Based on this review of the reliability of the system with the addition of a 247 MW project, the timeframes for completing the California ISO interconnection and the CPUC and other agency's permitting processes, it is unlikely that the project would be in service before 2020 and therefore would not meet the RPS goal for the Project Objectives.

Respectfully,

Hyung Shin, Ph.D.
Associate Electrical Specialist
Burns & McDonnell

Enclosures
-Hyung Shin Resume

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Hyung S. Shin, PhD

Expertise
- Transmission Planning
- Generation Planning
- Distribution Planning
- Power System Modeling
- Power System Economics
- Electric Railroad Systems

Education
- B.S. in Electrical Engineering, Seoul National University, 1980
- M.S. in Electrical Engineering, Seoul National University, 1982
- Ph. D. in Electrical Engineering, Seoul National University, 1991

Organizations
- Institute of Electrical and Electronics Engineers

Total Years of Experience
30

Years With Burns & McDonnell
11

Start Date
December 2002

Dr. Shin is a Project Manager and Senior Project Engineer in Business & Technology Services at Burns & McDonnell. During his career, he has gained a broad range of experience across generation, transmission, and distribution. He has extensive experience of power system analyses for both regional grid power systems and local distribution systems. He has strong expertise in application of analytical and optimization techniques to power system planning and operation. His expertise also includes computer applications in power system planning and analysis, and he developed several software programs that have been used in numerous projects.

Dr. Shin has managed or acted a lead engineer on numerous generation interconnection or transmission planning studies that included flow-gate impact and transfer capability analyses, as well as standard load flow, short circuit, and stability analyses. Dr. Shin has managed distribution planning projects that included distribution system database development and load flow and short circuit analyses. A summary of Dr. Shin's engagements is listed below.

CAISO Interconnection Process Support, PG&E
San Francisco, CA, 2011-2014

Mr. Shin served as project manager in supporting PG&E's transmission planning group to manage, perform, and oversee the CAISO Cluster Studies. Mr. Shin participated in the interconnection process including the interconnection request review, scoping meetings, technical studies, report writing and results meetings. Mr. Shin also performed power flow and transient stability analysis as a part of the effort. The study tasks included identifying mitigation options from steady state power flow analysis results, performing transient stability analysis to identify potential stability issues, and developing mitigation options.

Induced Voltage Evaluation Study, NIPSCO
Merrillville, IN, 2014

Mr. Shin served as project manager for the Induced Voltage Evaluation study. The purpose of the study was to evaluate induced voltages from a new 345 kV transmission line on the existing 345 kV line in the same corridor. The analysis model was developed using EMTP/ATP software. The transmission lines were modeled with the tower configuration considered. The analysis was performed for various normal operating and faulted conditions.

Transmission Alternatives Comparison Study, SDG&E
San Diego, CA, 2013-2014

Mr. Shin served as lead engineer for the transmission alternatives comparison study. The purpose of the study was to compare of several alternatives to increase the import capability of SDG&E's transmission system with an addition of a 500 kV AC/DC transmission line interconnecting with the neighbor system. Load flow, short circuit, transfer capability, and transient stability analyses were performed to assess the system performance for each of the alternatives.

Long-Range Transmission Planning Study, Midwest Energy, Inc.
Hays, KS, 2013

Mr. Shin served as project manager for a long-range transmission planning study. The purpose of the study was to examine the ability of the transmission system to serve the projected load levels in the near-term and longer-term planning horizons. The study tasks included power flow analysis, load pocket analysis, short circuit analysis, and stability analysis. Recommendations for system upgrades and planning strategy to maintain the adequate level of system reliability.

System Operating Limit Study, Alberta Electric System Operator
Alberta, Canada, 2012

Mr. Shin served as project manager for a System Operating Limit (SOL) study. The purpose of the study was to assess the SOLs for the Alberta interties with the Western Electricity Coordinating Council (WECC). Steady state, voltage stability, and dynamic stability analyses were conducted for the near-term and longer-term study horizons in order to determine the changes in the SOL with the changes in system configuration, loading, and generation. The study identified steady state and voltage stability limits under specific contingency conditions.

Sub-Synchronous Resonance Study, NRG Energy
Houston, TX, 2011

Mr. Shin performed sub-synchronous resonance study for solar thermal generation project in Southern California. The purpose of the study was to identify sub-synchronous natural frequencies of the network that may arise due to the series compensated transmission lines. The sub-synchronous frequencies can create resonance and cause damages to the shaft system of the solar thermal generator unit. Mr. Shin developed a PSCAD model of the surrounding transmission system and performed harmonic frequency scans to identify the natural frequency of the network.

Switching Transient Study, Cross Texas Transmission
Pampa, TX, 2011

Mr. Shin performed a switching transient study for the 345 kV transmission facilities which will be built as part of the Texas Competitive Renewable Energy Zones (CREZ) Transmission Project to deliver renewable energy from the CREZ to urban load centers. The objective of the study was to assess the transient and temporary overvoltages and transient recovery voltage related with the new 345 kV lines. The switching transient analysis was performed using the EMTP software.

Transient Stability Analysis, Federal Research Center – White Oak
Silver Spring, MD, 2010

Mr. Shin performed transient stability analysis to evaluate the capability of the plant power system to respond to disturbances and transition to a new stable operating condition. The analysis also included a scenario for the plant to go into an islanding mode. The system including the plant generators and the low voltage motor loads were modeled using the SKM I*SIM software. Mr. Shin provided the analysis results for the transient stability performance of the generators for various fault scenarios.

Distribution Network Modeling and Study, City of Holyoke Gas & Electric
Holyoke, Massachusetts, 2010

Mr. Shin served as a lead engineer for a distribution network modeling and study project for HG&E. Burns & McDonnell provided services for developing a distribution model database and power flow analysis to provide recommendations for orderly development of the City of Holyoke's electric distribution network. The project involved extensive efforts for collection and processing of the distribution network data.

Solar Photovoltaic Generation Interconnection Study, Old Dominion Electric Cooperative
Glen Allen, VA, 2010

Mr. Shin performed harmonics analysis and voltage flicker study for solar photovoltaic generation plants. Mr. Shin developed a PWM inverter model using the EMTP software to analyze harmonics created by the solar photovoltaic generation plants. Mr. Shin performed power flow analysis to assess potential voltage flicker considering variable output due to cloud covering.

Solar Photovoltaic Generation Plant Capacitor Sizing Analysis, Sempra Energy Resources

San Diego, CA, 2010

Mr. Shin performed power flow modeling and analysis for a solar photovoltaic generation plant. The purpose of the study was to estimate the required capacitor bank size to offset the reactive power loss on the system. The solar photovoltaic generation plant was modeled with an equivalent inverter step-up transformer, a station transformer and a double circuit 240 kV transmission line.

Transient Stability Analysis, ExxonMobil Torrance Refinery

Torrance, CA, 2009

Mr. Shin performed transient stability analysis in the process of relay programming scheme for the refinery plant substation. Mr. Shin modeled the plant generators and the low voltage motor loads using the SKM I*SIM software. Mr. Shin provided the analysis results for the transient stability performance of the generators for various fault scenarios.

Voltage Unbalance Study, AltaLink

Alberta, Canada, 2010

Burns & McDonnell was retained by AltaLink to provide technical analyses for series compensator application on a new double circuit 240 kV transmission line. Mr. Shin performed voltage unbalance analysis for evaluation of transposition options. Mr. Shin developed an EMTP model to analyze voltage unbalance for various line transposition configurations.

Analysis of the Control Performance Standard, Northern Indiana Public Service Co.

Hammond, IN, 2005-2008

Mr. Shin performed evaluation of CPS compliance for NIPSCO to identify measures to improve the control performance: ACE, CPS1 and CPS2. He developed a computer simulation tool to analyze the effect of the improvement measures on the control performance. He developed the sign-check scheme to improve the CPS1 value while reducing AGC actions. The simulation tool helps increase the margin to comply with CPS1 as the system frequency varies.

Generation Interconnection System Impact Study, Midwest Independent Transmission Operator

Carmel, IN, 2003-2010

Mr. Shin served as the project manager and/or lead analyst for numerous generator interconnection studies for interconnection of new combustion turbine or wind farm generating facilities. The interconnection studies included load flow, transfer capability, short circuit, and stability analyses. Mr. Shin built the stability model using NMORWG (Northern MAPP Operation Review Working Group) stability study package and analyzed the transient stability analysis results.

Wind Generation Interconnection Study, Alberta Electric System Operator

Alberta Canada, 2009-2010

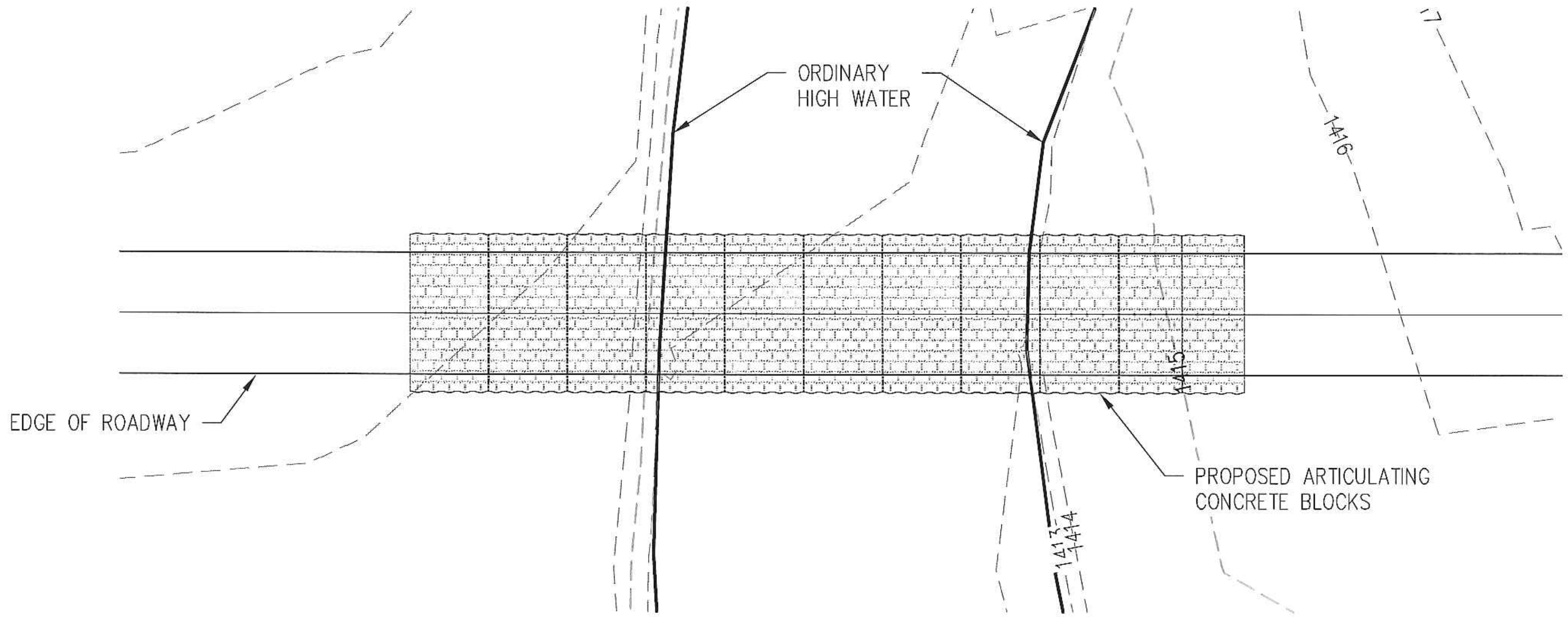
Mr. Shin served as the project manager and/or lead analyst for the Generation Interconnection Studies for the Alberta Electric System Operator (AESO). Mr. Shin performed load flow, short circuit, and stability analyses. Burns & McDonnell provided the AESO with the technical analysis results for the Needs Identification Document submitted to the Alberta Utilities Commission.

Transmission Expansion Planning, Southwest Power Pool
Little Rock, AR, 2006

Mr. Shin provided services for SPP's Transmission Expansion Planning. Mr. Shin performed load flow analysis to find resolutions to the thermal and voltage violations for long range transmission expansion planning. Fifteen load flow dispatch scenarios were evaluated to capture potential problems in various operating conditions.

APPENDIX E

WH Pacific Report



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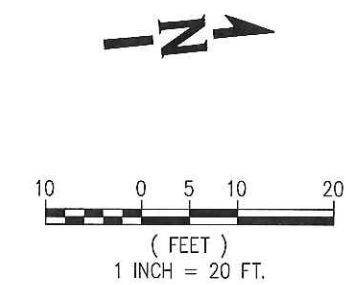

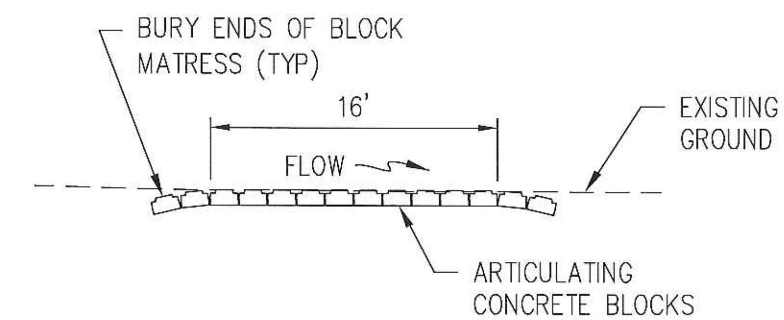

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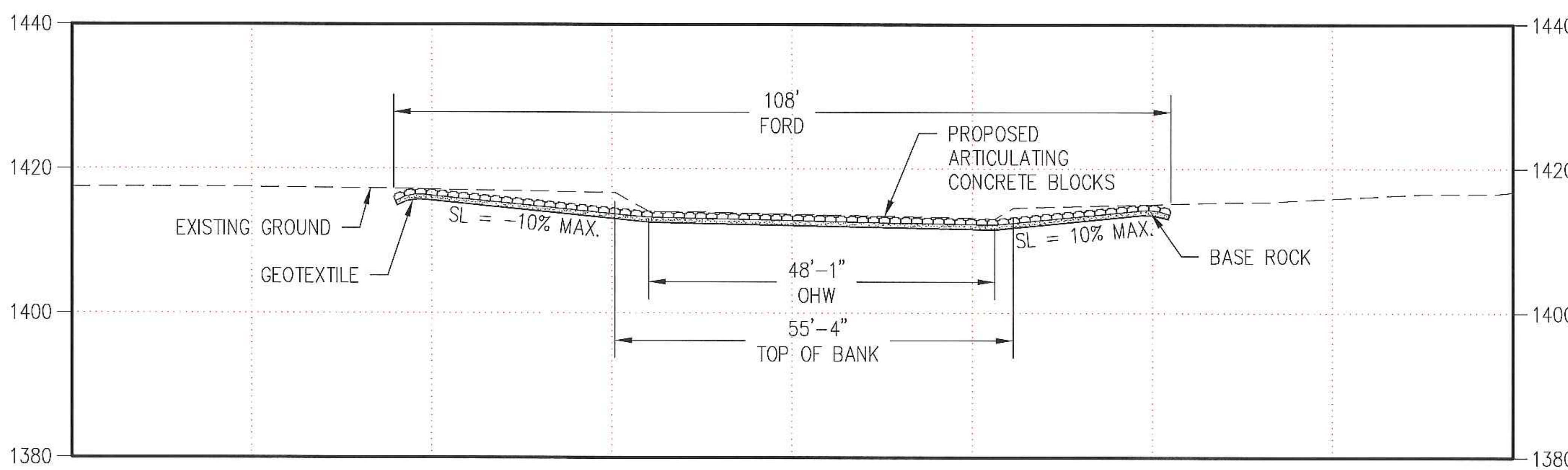

ELEVATION

CROSSING 4 - FORD

PANOCHE VALLEY SOLAR FARM
PLAN, ELEVATION AND TYPICAL SECTION

WHPacific

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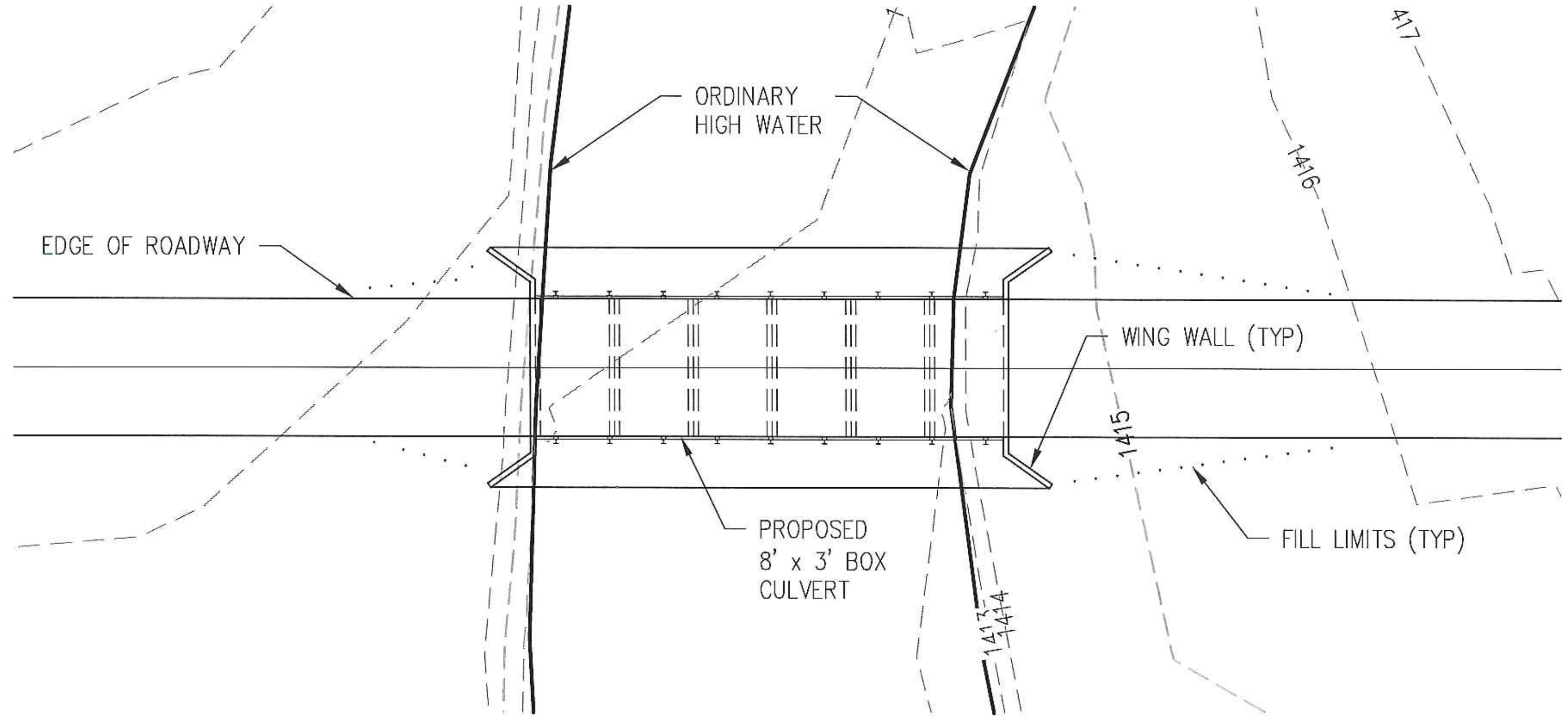

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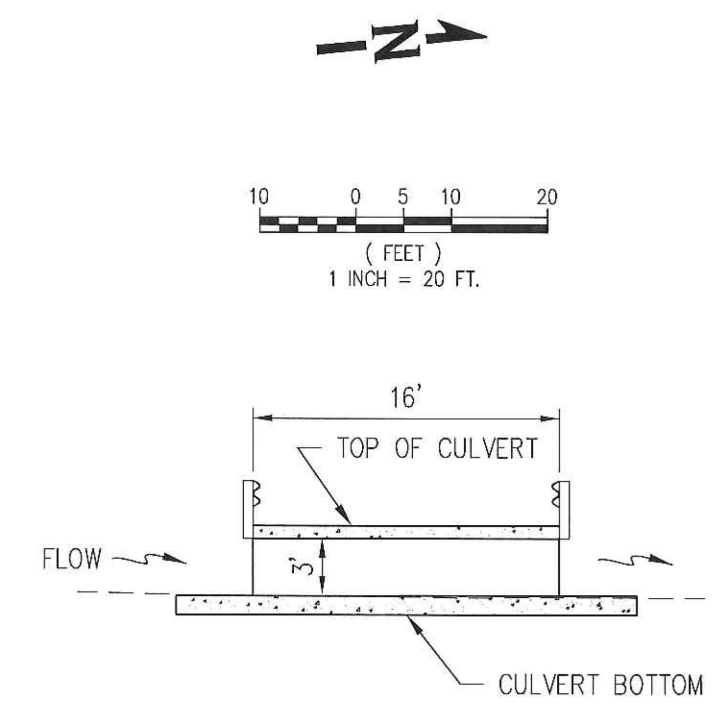

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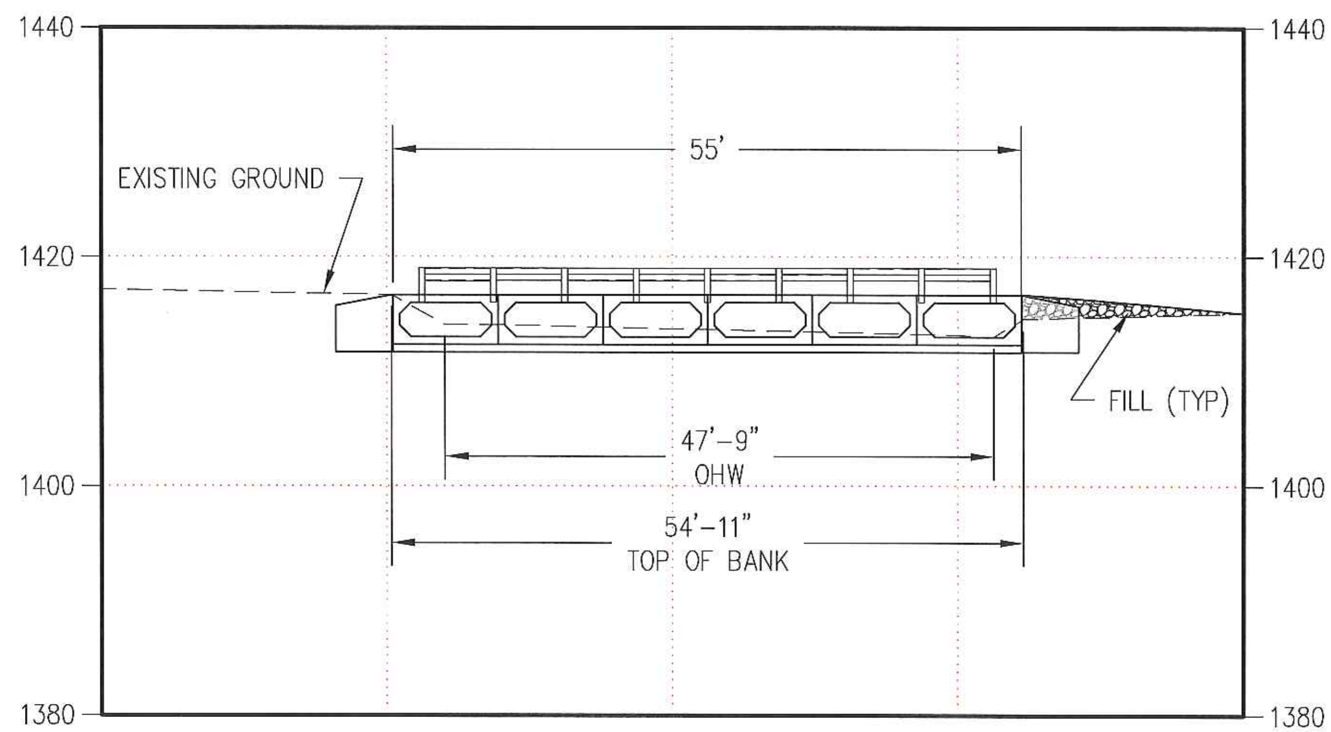

ELEVATION

CROSSING 4 - CULVERT

PANOCHE VALLEY SOLAR FARM
PLAN, ELEVATION AND TYPICAL SECTION

WHPacific

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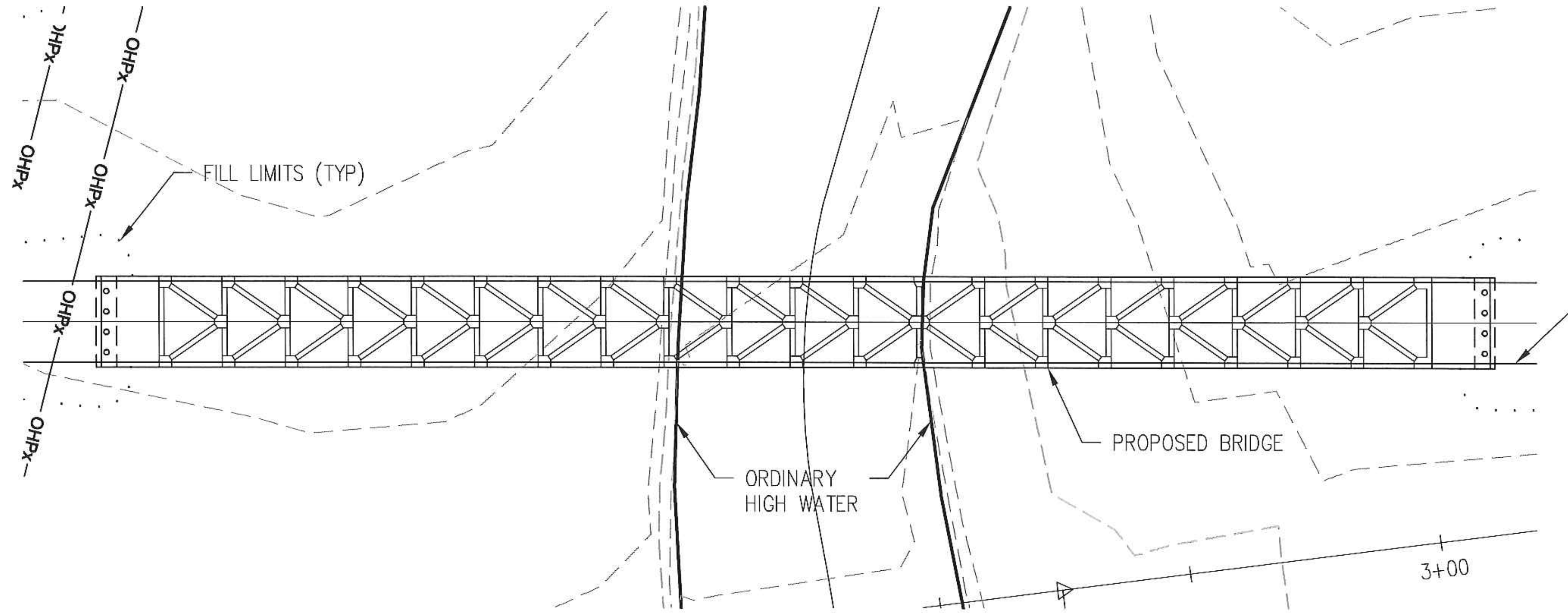

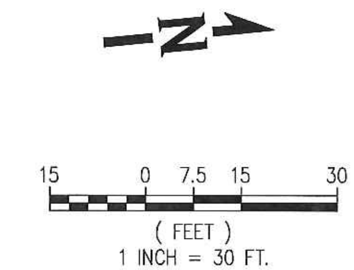

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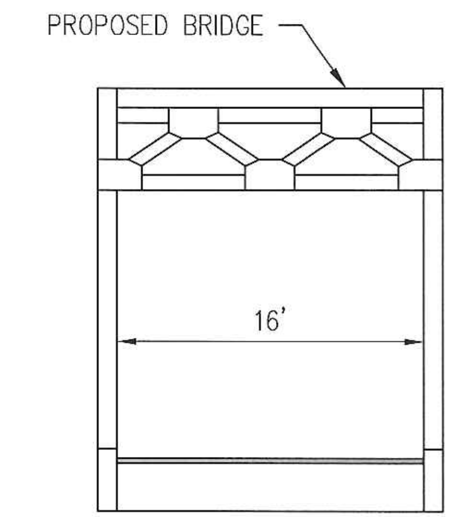

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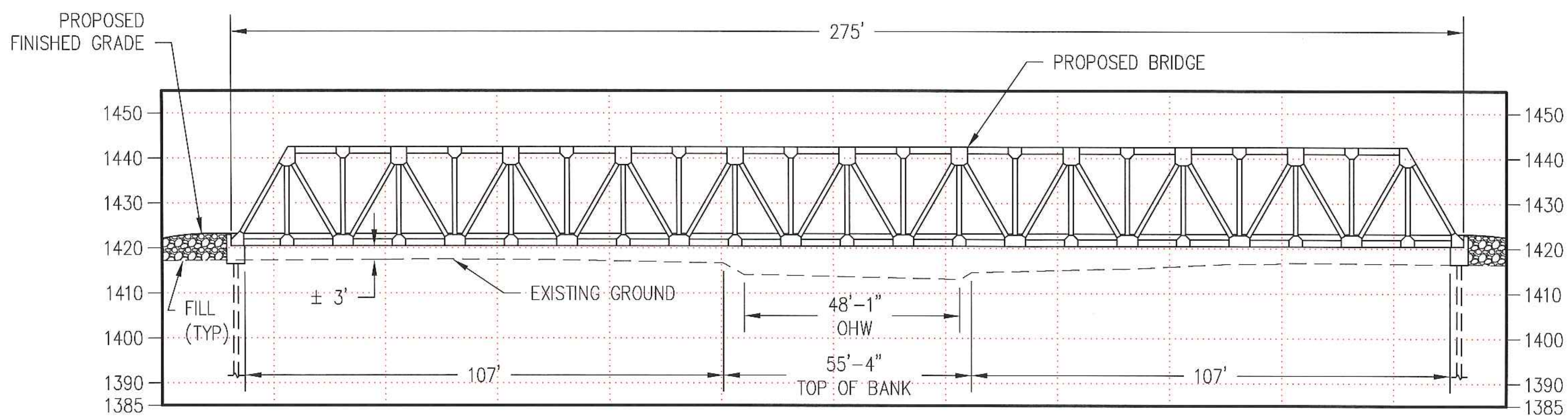

ELEVATION

CROSSING 4 - FREE SPAN

PANOCHE VALLEY SOLAR FARM
PLAN, ELEVATION AND TYPICAL SECTION

WHPacific

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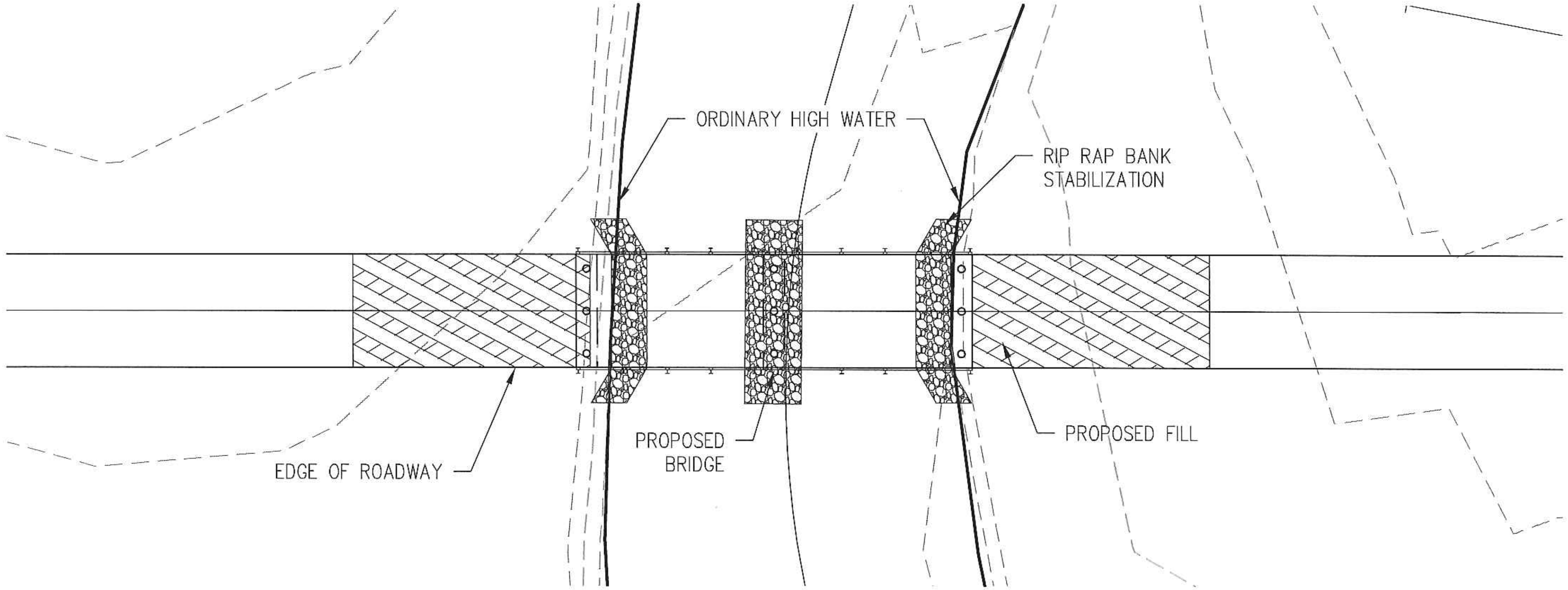

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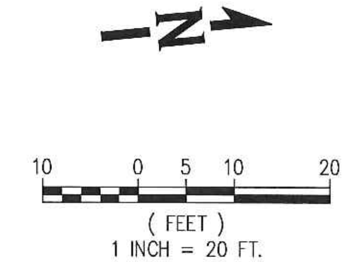

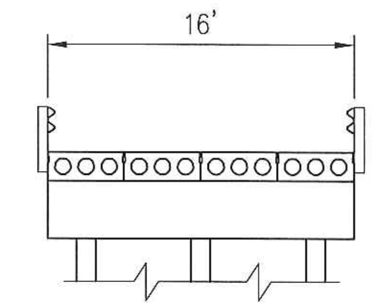

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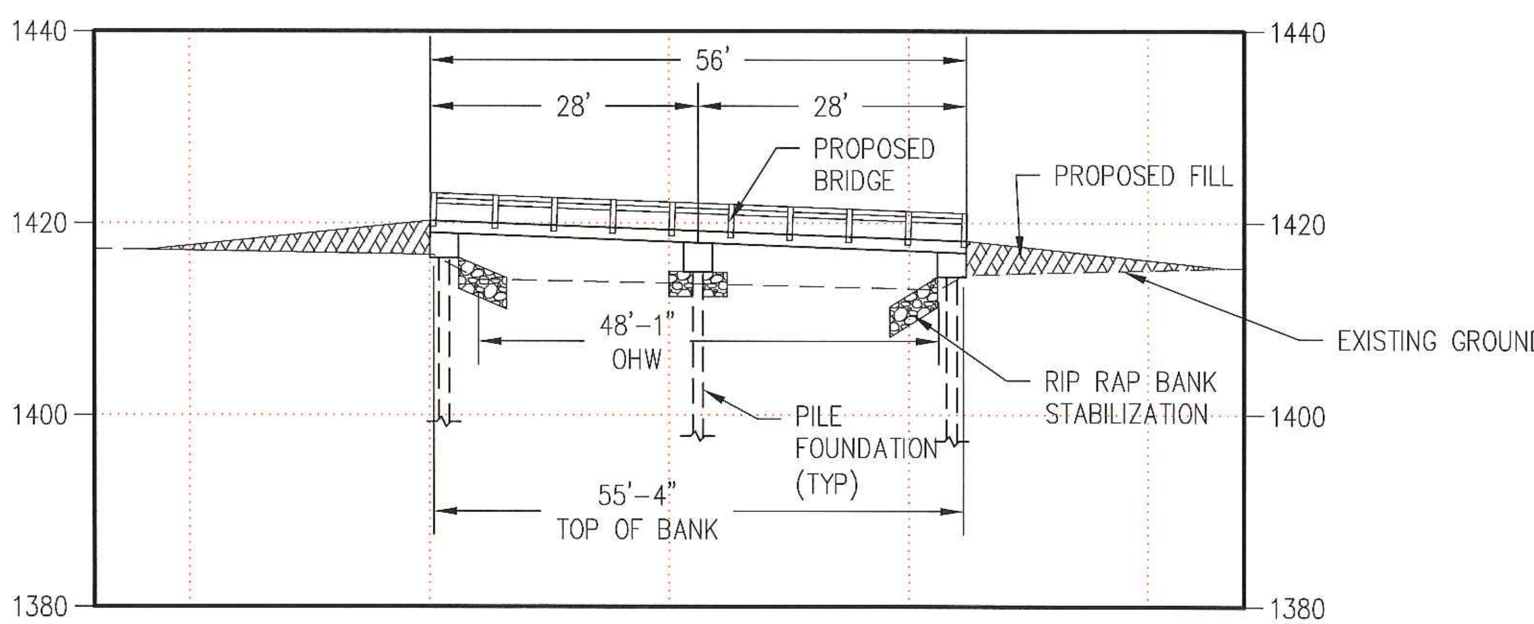

ELEVATION

CROSSING 4 - MULTI SPAN

PANOCHE VALLEY SOLAR FARM
PLAN, ELEVATION AND TYPICAL SECTION

WHPacific

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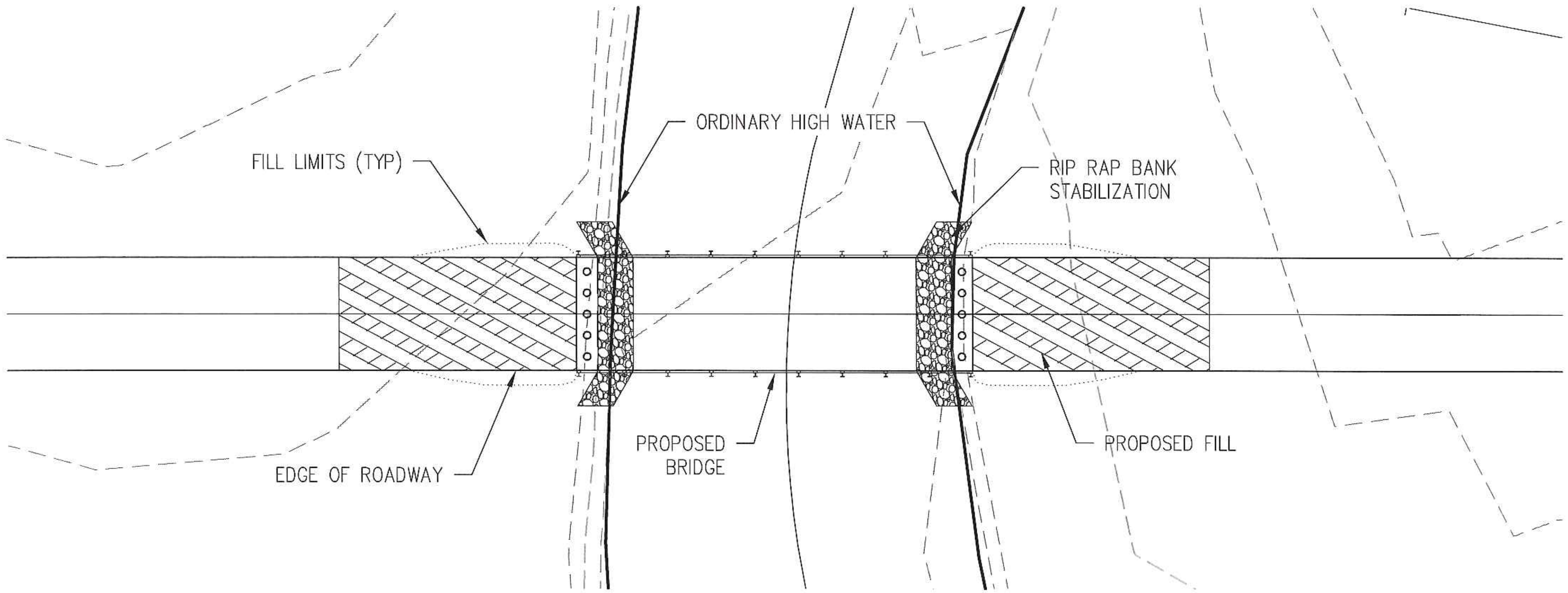

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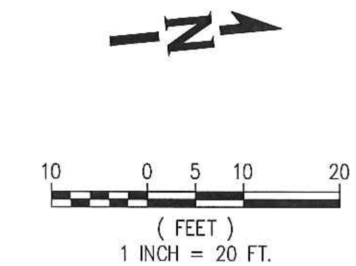

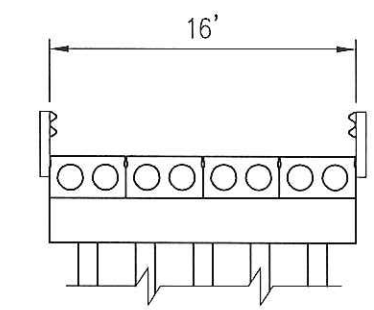

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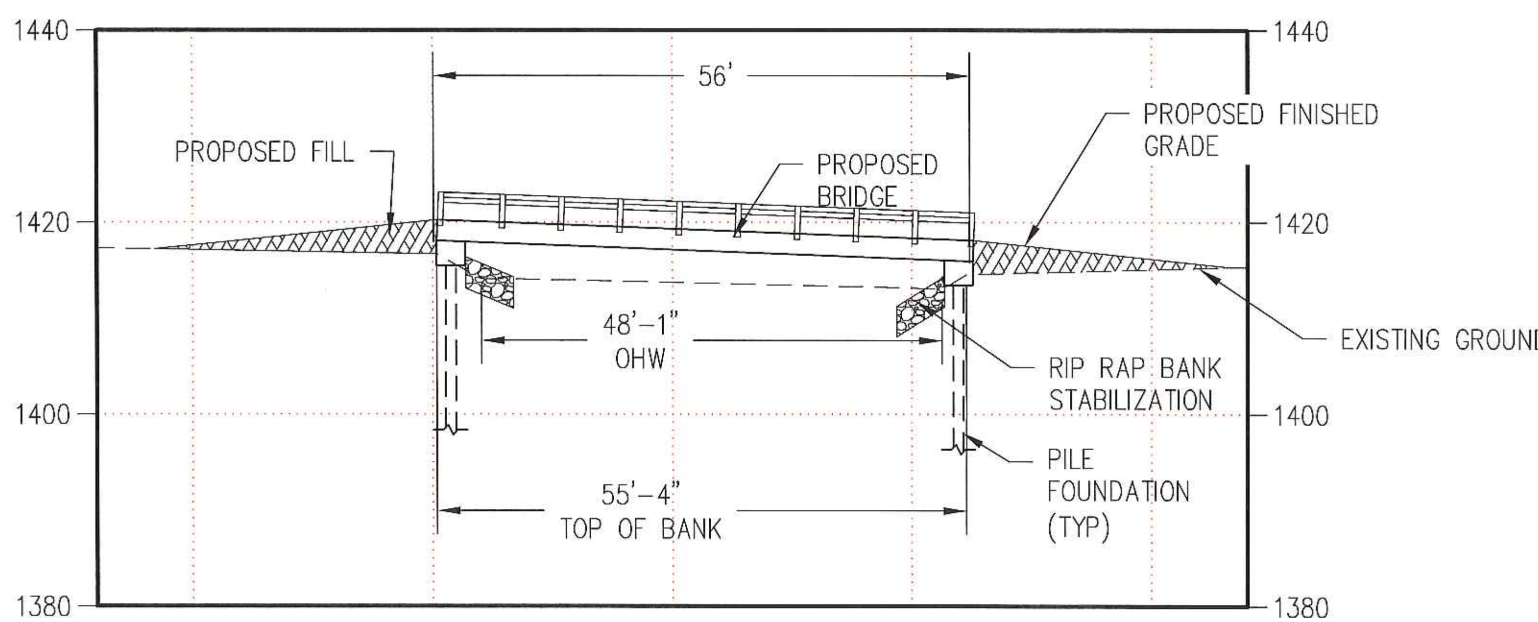

ELEVATION

CROSSING 4 - SINGLE SPAN

PANOCHE VALLEY SOLAR FARM
PLAN, ELEVATION AND TYPICAL SECTION

WHPacific

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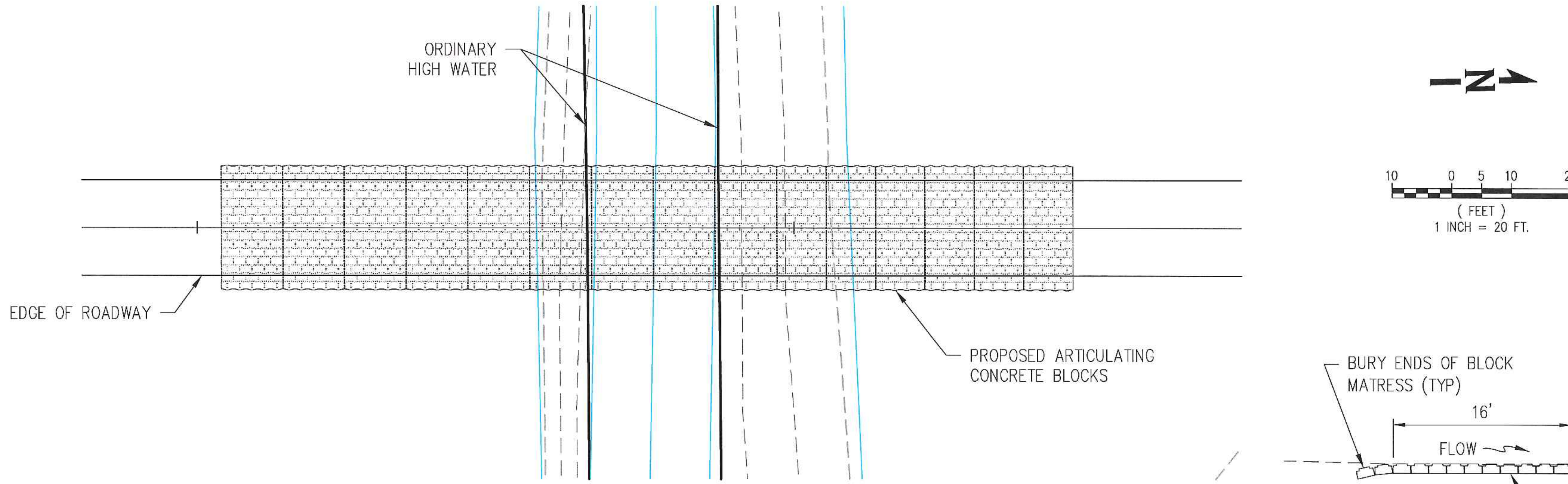

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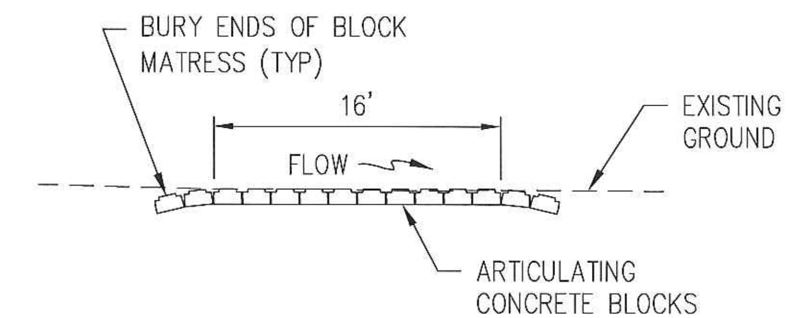

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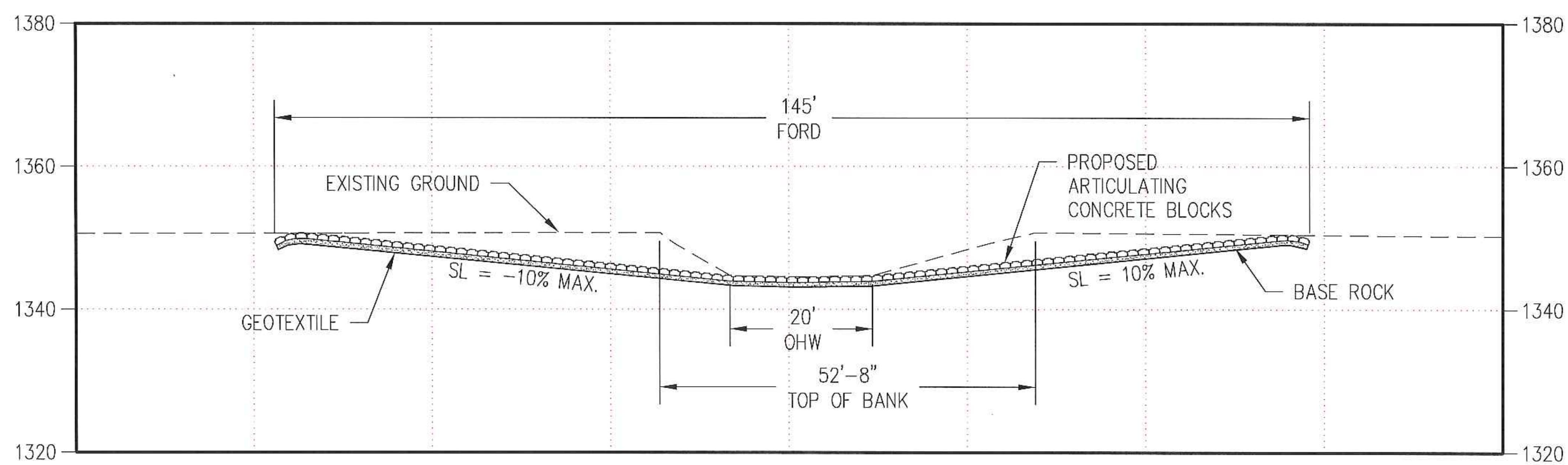

ELEVATION

CROSSING 5 - FORD

PANOCHE VALLEY SOLAR FARM
PLAN, ELEVATION AND TYPICAL SECTION
WHPacific

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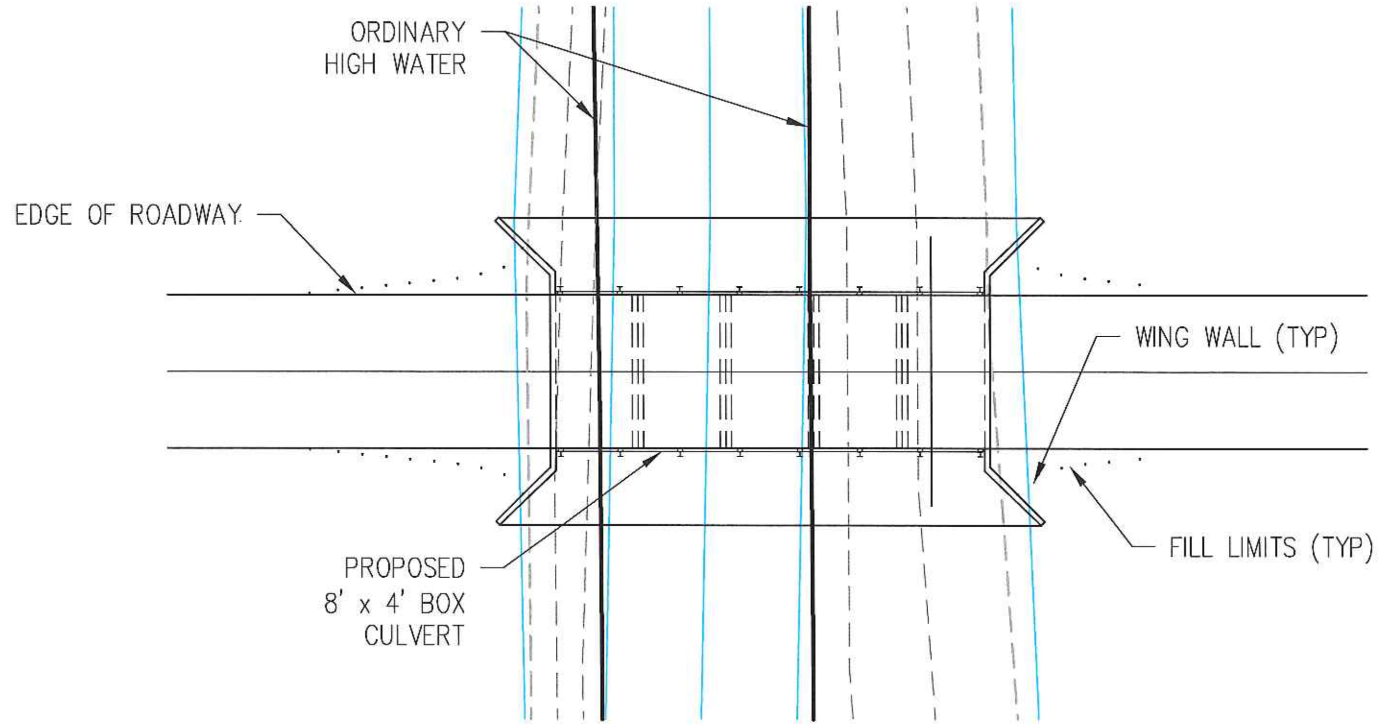
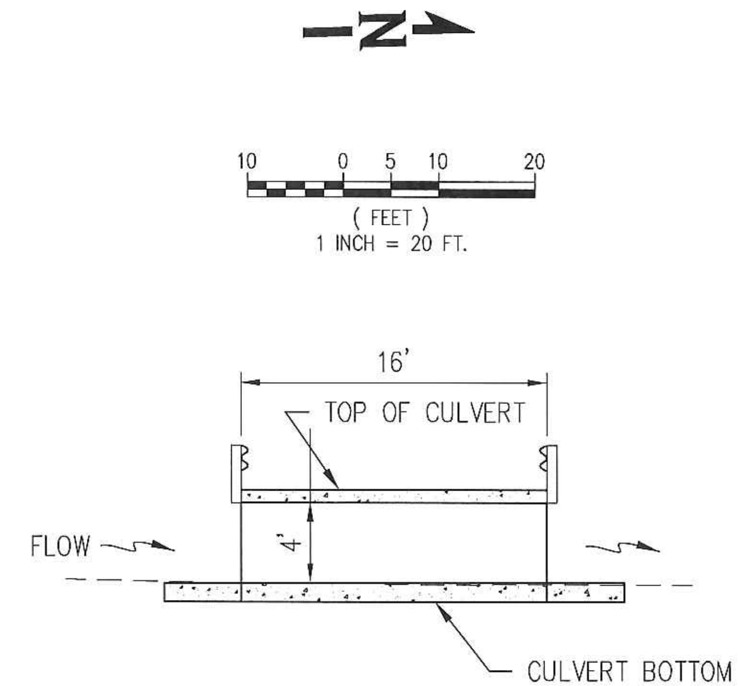


PLAN



TYPICAL SECTION
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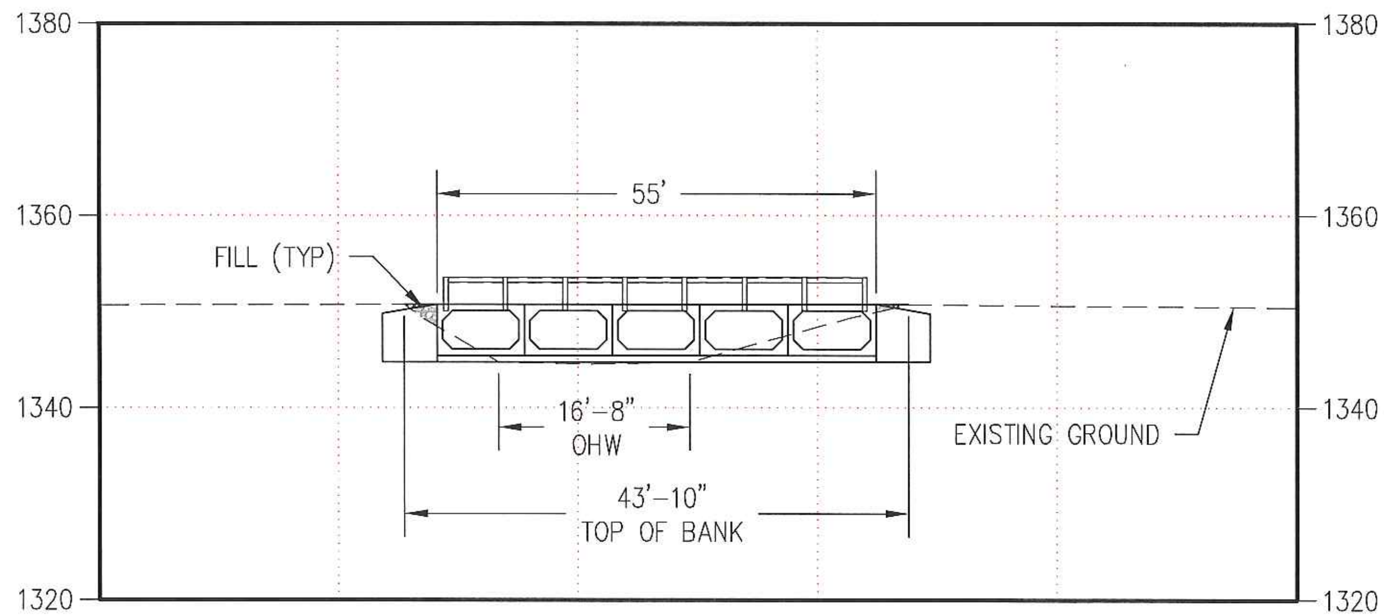

ELEVATION

CROSSING 5 - CULVERT

PANOCHE VALLEY SOLAR FARM
PLAN, ELEVATION AND TYPICAL SECTION

WHPacific

PROJECT NUMBER	DRAWING FILE NAME	DATE
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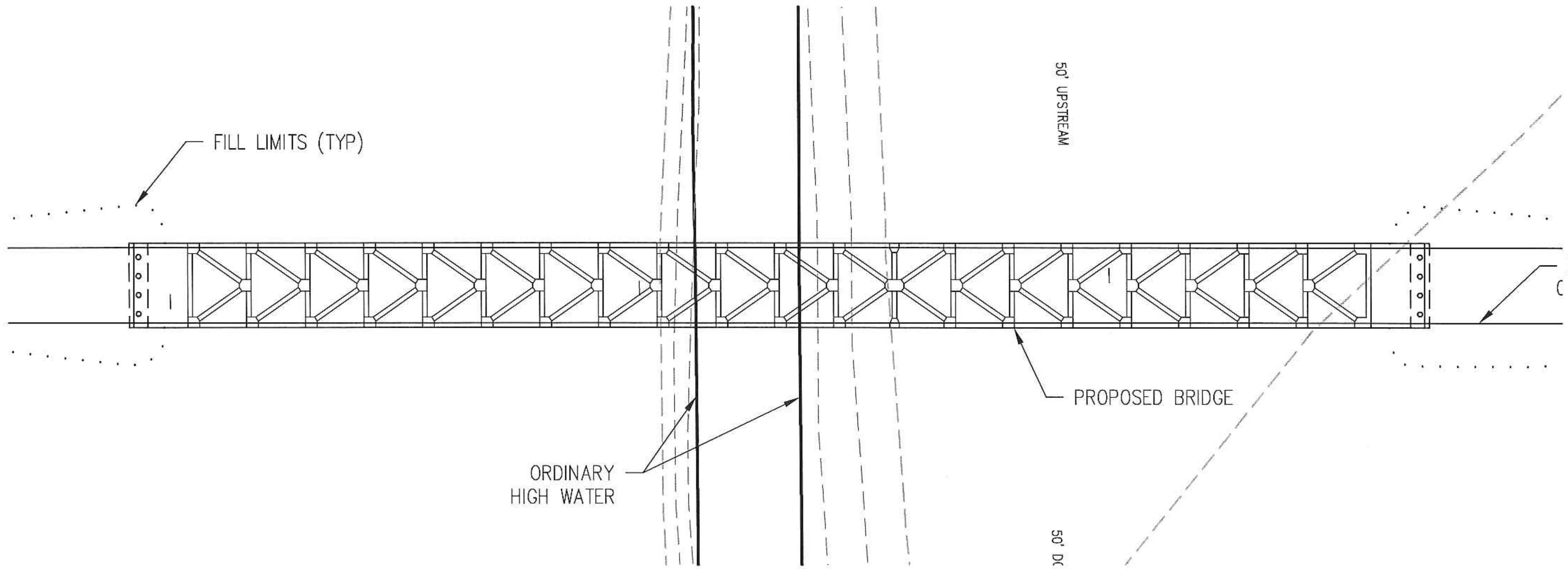
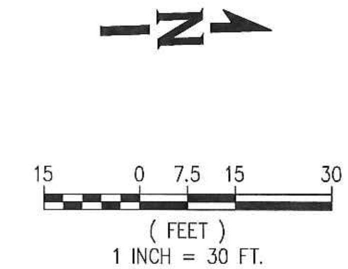
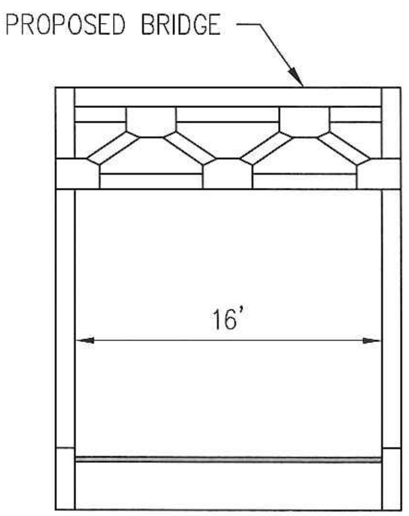


PLAN





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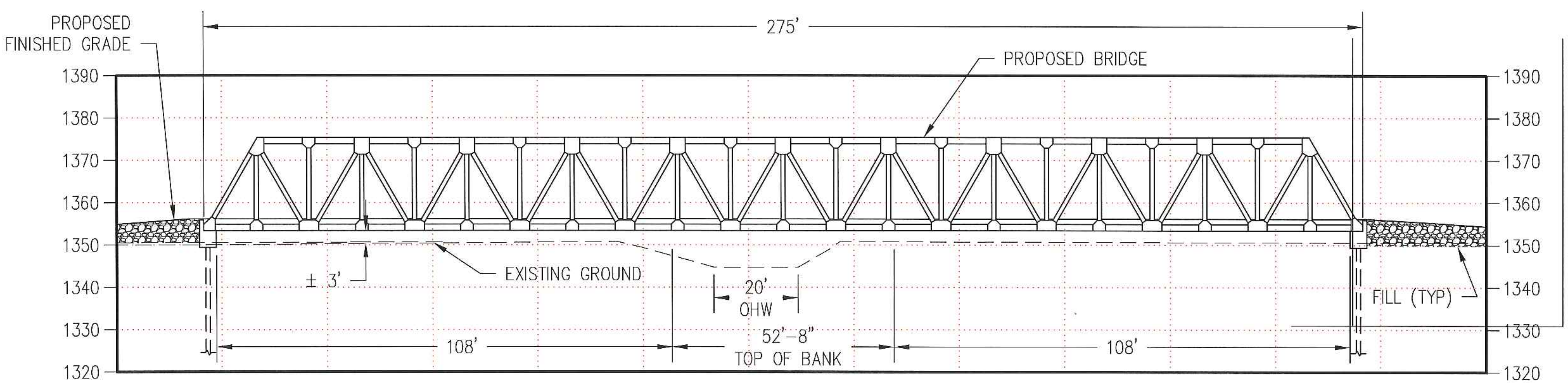

ELEVATION

CROSSING 5 - FREE SPAN

PANOCHE VALLEY SOLAR FARM
PLAN, ELEVATION AND TYPICAL SECTION

WHPacific

PROJECT NUMBER	DRAWING FILE NAME	DATE
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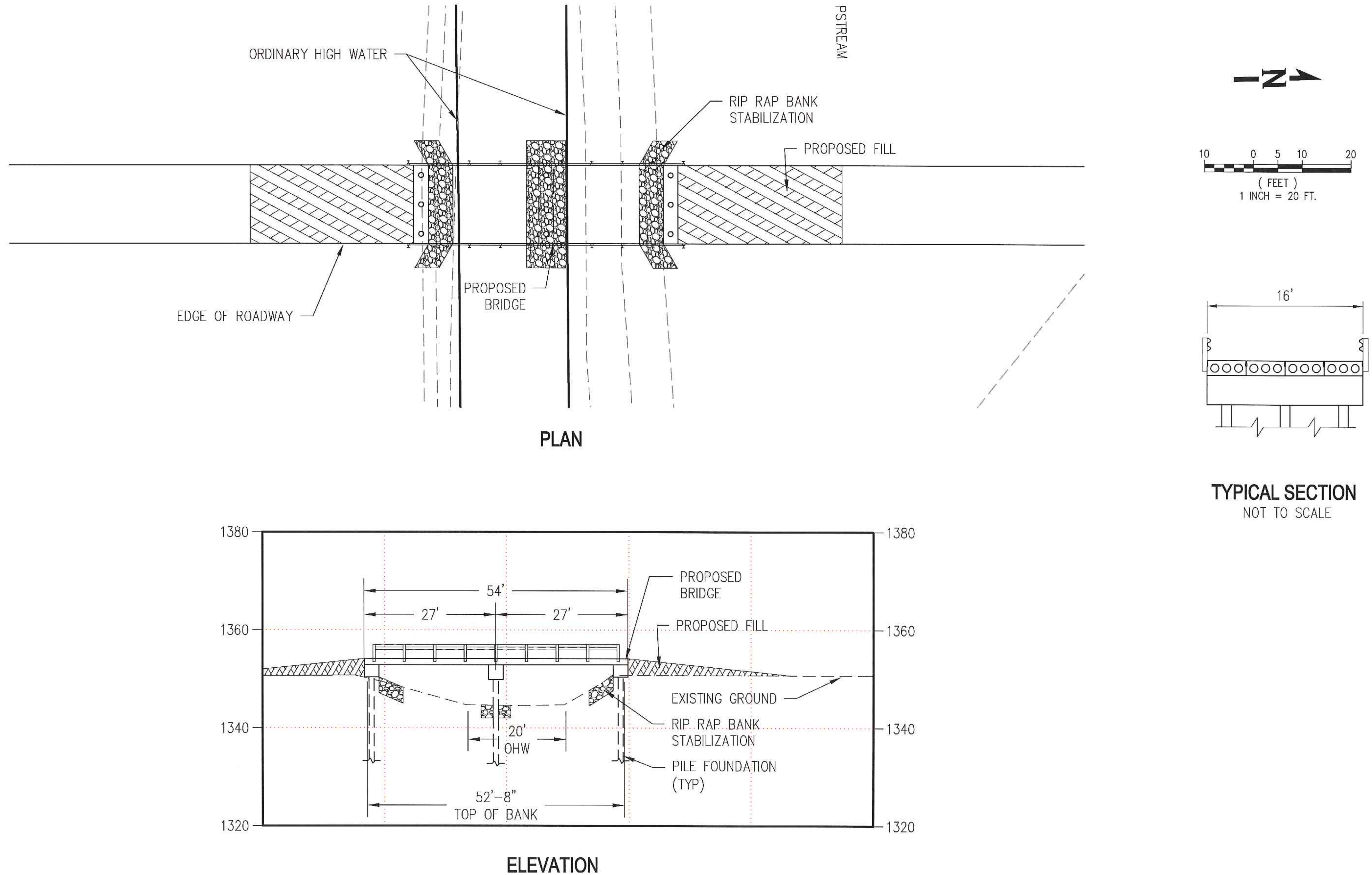

CROSSING 5 - MULTI SPAN

PANOCHE VALLEY SOLAR FARM
PLAN, ELEVATION AND TYPICAL SECTION
WHPacific

PROJECT NUMBER	DRAWING FILE NAME	DATE
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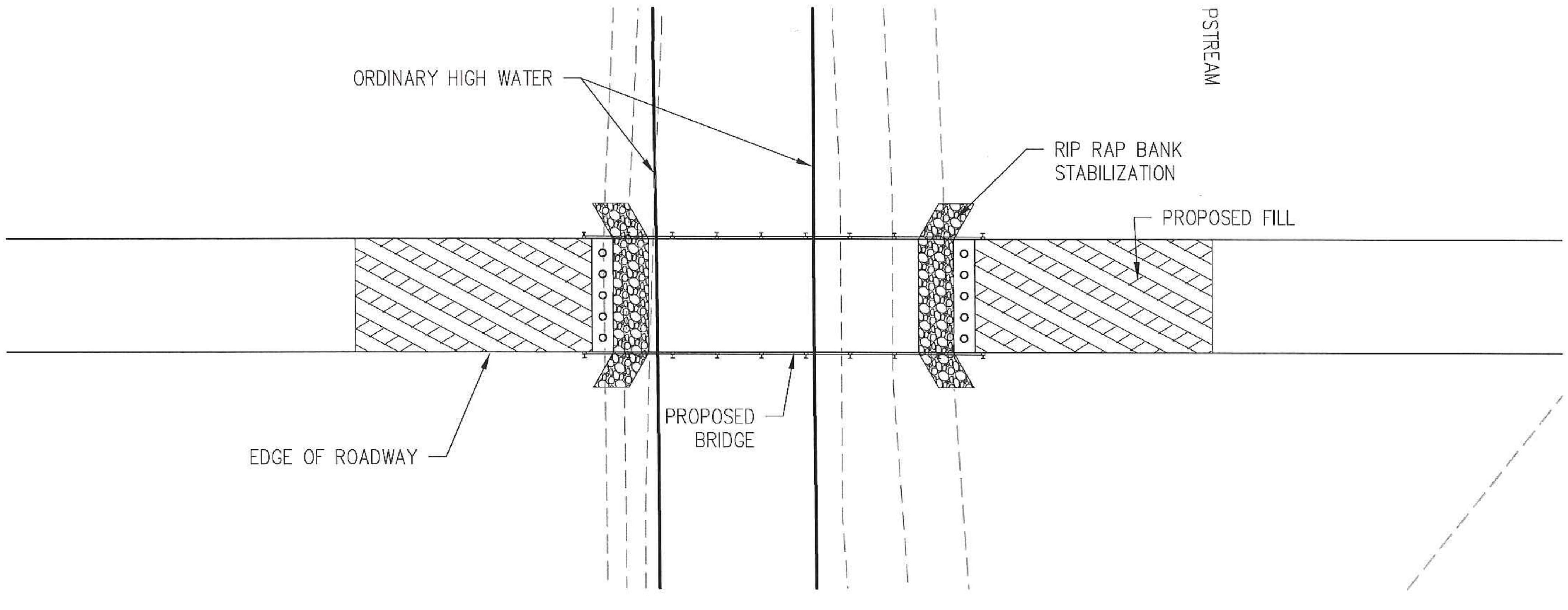

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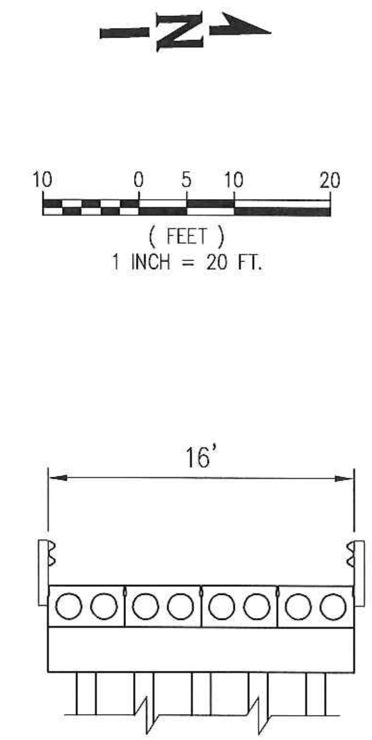

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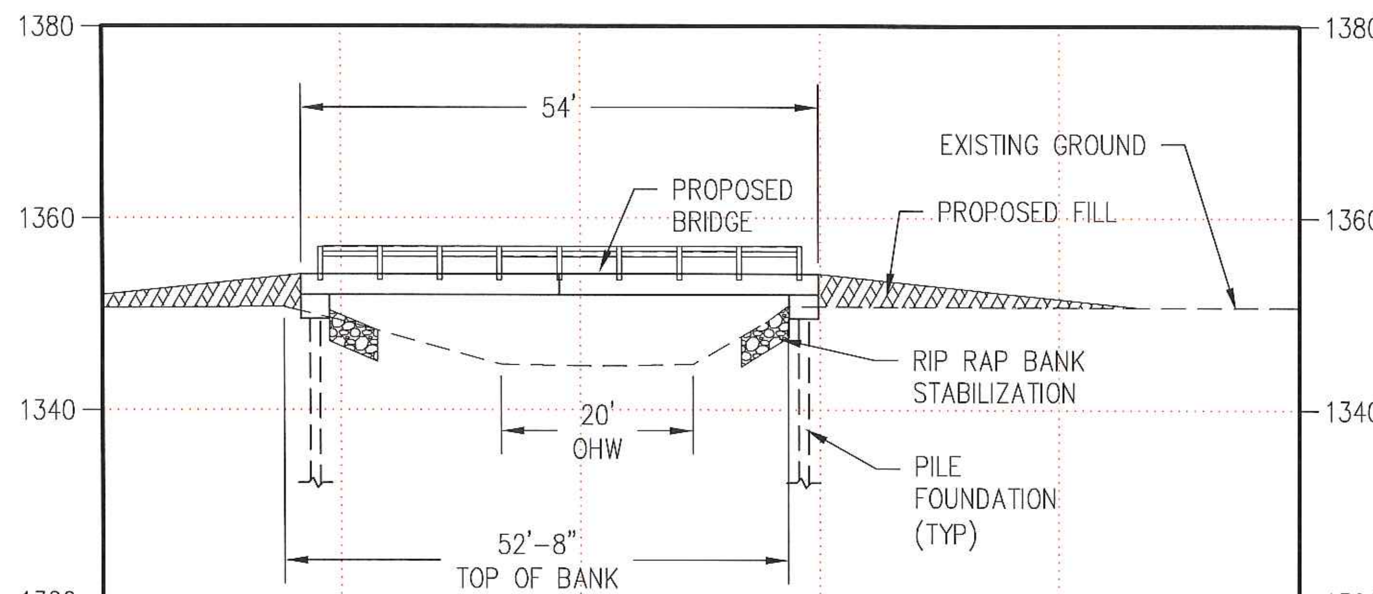

ELEVATION

CROSSING 5 - SINGLE SPAN

PANOCHE VALLEY SOLAR FARM
PLAN, ELEVATION AND TYPICAL SECTION

WHPacific

PROJECT NUMBER	DRAWING FILE NAME	DATE
035916	035916_EX02.dwg	10-08-13

Panoche Valley Solar Farm

San Benito County, California

Stream Crossing Alternative Study & Hydraulic Report

***Prepared for*:**

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305 Camp Craft Rd, Suite 575
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503-372-3611

Design Engineers:
Structural – Paul Tappana, P.E.
Hydraulic – John Marks, P.E., Devin Doring, E.I.T.

Original: February 12, 2014

INTRODUCTION

This report is a continuation of a previous study and addresses the hydrologic and hydraulic research and analysis that was conducted as part of the Panoche Valley Solar Facility (PVSF) project in San Benito County, California. The objective of this effort was to analyze the existing conditions and document the associated conditions with five proposed bridge locations. A hydraulic analysis was performed for the purpose of designing bridge structures and at grade fords at creek crossings on the PVSF project that will provide access to the entire facility during a 100 year flood event.

Five bridge models are being analyzed at both creek crossing. The first bridge model is a ford crossing that requires laying back the slope and crossing at grade. The second bridge model is a multi-barreled, concrete box culvert structure. The third bridge model is a free span bridge that has abutments 100 feet distant from the top of bank on either side of the channel. This structure is intended to span the channel and both overbank areas. It will however require approach fills at both ends to allow for a minimum of 3 feet of clearance below the bridge superstructure. The fourth bridge model is a multi-span structure with abutments near the top of channel banks and a pier in the channel. The fifth bridge option is a single span bridge with abutments near the top of channel banks.

REGULATORY STANDARDS

The PVSF project is within a regulatory Federal Emergency Management Agency (FEMA) floodplain. The crossing sites are located within a Zone A region which is defined as "Special flood hazard areas subject to inundation by the 1% annual chance flood, no base flood elevation determined". If a particular scenario demonstrates a no-rise scenario, regulatory standards will easily be satisfied. However, if backwater occurs, negotiations with the appropriate authorities, San Benito County and FEMA, will be required. FEMA may defer to the local authorities. It may be possible to negotiate allowing a backwater rise, most likely limited to a foot.

BASIN RESEARCH

Three major creeks flow through the PVSF project. A unnamed creek flows from the northern edge of the project and joins Las Aguilas Creek near the center of the project. Panoche Creek flows along the southern edge of the project and forms a confluence with Las Aguilas Creek near the southeast corner of the project. Las Aguilas Creek flows from northwest to southeast and has a drainage basin of approximately 9.9 square miles above crossing site numbered 4. Panoche Creek flows from west to east and has a drainage basin of approximately 44.7 square miles above crossing site 5. The Las Aguilas Creek watershed varies in elevation from about 1415 feet at crossing site 4 to a maximum of 3639 feet. The Panoche Creek watershed varies in elevation from about 1345 feet at crossing site 5 to a maximum of 3969 feet. The watershed is subject to winter storms in which precipitation is mainly in the form of rain. High flows if they occur typically occur in the winter months.

SITE INVESTIGATION

A site investigation of the study area was conducted by John R. Marks and Paul Tappana of WHPacific on June 27, 2012 and then again on September 24, 2013. The purpose of the site investigation was to review the sites for hydrologic, hydraulic and scour concerns that may affect the proposed creek crossings. Survey mapping of the area was completed by WHPacific survey crew. The survey also included a digital terrain model (DTM) that was used to develop cross sections needed in the hydraulic modeling. Google Earth data was used to supplement elevation data for the extensive floodplain outside the extents of the survey. The following observations were made during the site visit.

1. **Lateral Channel Stability**

   The creek alignment meanders slightly within moderately moving channel boundaries of the adjacent grass land.

2. **Aggradation /Degradation**

   The relatively low slope condition of the creek channel and the steepness of the channel's banks indicate that both aggradation and degradation will be unlikely.

3. **Manning's *n***

   The left and right overbank areas through all reaches consist of grassland. A Manning's n value of 0.030 was assigned for this condition. The main channel throughout consists of silt, sand and gravel with scattered cobbles. A Manning's n value of 0.030 was assigned for the channel.

4. **Riprap**

   No riprap is present.

5. **Bed Material**

   The bed material was observed to be silt, sand and gravel with scattered cobbles with an estimated D_{50} of 0.1 mm.

6. **Evidence of Scour**

   There is some evidence of isolated scour on the outside of bends on both creeks.

7. **Abutment Alignment**

   There are no bridges at the proposed bridge sites.

8. **Hydraulic Controls**

   No hydraulic controls are present.

9. **High Water Marks**

   No high water marks were observed.

10. **Debris**

    The woody debris potential for the watershed appears to be moderate to high.

Based on this information WHPacific also looked at long term scour and have included additional removal and fill to help stabilize the long term features of the crossings due to erosion.

HYDROLOGY

The peak discharges for these ungauged watersheds have been taken from a USGS online application called StreamStats for California (http://streamstats.usgs.gov/california.html). Storm event flows were provided at standard intervals. The discharges used in the hydraulic analysis of the proposed crossing structures are provided below:

Crossing Site 4

Q_2 = 25 cfs

Q_5 = 115 cfs

Q_{10} = 243 cfs

Q_{25} = 498 cfs

Q_{50} = 793 cfs

Q_{100} = 1170 cfs

Q_{500} = 2470 cfs

Crossing Site 5

Q_2 = 105 cfs

Q_5 = 473 cfs

Q_{10} = 970 cfs

Q_{25} = 1940 cfs

Q_{50} = 3070 cfs

Q_{100} = 4430 cfs

Q_{500} = 9090 cfs

HYDRAULICS

The US Army Corps of Engineers, Hydrologic Engineering Centers River Analysis System computer program (HEC- RAS Version 4.1.0) was used to compute the channel hydraulics. Hydraulic models were developed for the “natural channel” conditions of the sites and the requested bridge/culvert alternatives. Ten stream cross-sections were used to develop the hydraulic models at sites 4 and 5. The cross-sections were selected to adequately model flow through the site locations for both Las Aguilas Creek and Panoche Creek.

The proposed alternatives, except for the free span bridges, were modeled to provide maximum conveyance through the sites with using minimal approach fill. The single and multi-span structures were modeled with approach fills to elevate the superstructure above the overbank area. The water surface elevations for each model were calculated using the provided flow data from StreamStats. It should be noted that on the bridge profile sheets where water surface elevations are depicted, that some storms which are higher than the stated maximum conveyable storm for a site may appear as though it can “fit” under the bridge or culvert. However, what is not seen is that these storms cover the approach roadway past the extents of the profile window. Detailed printouts of the results are provided in the Appendix.

TABLE 1. Hydraulic Data Sheet for the Existing Condition and Proposed Bridges at Site 4.

	Natural Conditions			56-Foot Multi-span		56-Foot Single-span	
	25-Year Flood	50-Year Flood	100-Year Flood	Conveyable Storm Event for Site[5]	100-Year Flood	Conveyable Storm Event for Site[5]	100-Year Flood
Discharge (ft^3/s)	498	793	1170	498	1170	498	1170
Recurrence Interval (yrs)	25	50	100	25	100	25	100
Approach Section H.W. Elevation with Natural Channel[1] (ft)	1415.98	1416.38	1416.74	1415.98	1416.74	1415.98	1416.74
Approach Section H.W. Elevation with Bridge[1]	-	-	-	1416.12	1417.10	1416.07	1417.09
Backwater (ft)	-	-	-	0.14	0.36	0.09	0.35
H.W. Elevation at Upstream Face of Bridge[2] (ft)	1415.34	1415.75	1416.19	1415.32	1417.15	1415.28	1417.14
H.W. Elevation at Downstream Face of Bridge[3] (ft)	1414.90	1415.37	1415.79	1414.90	1417.05	1414.84	1417.03
Waterway Area at Downstream Face of Bridge[3,4] (ft^2)	73.5	109.4	149.5	68.0	413.1	67.4	415.9
Average Velocity at Downstream Face of Bridge[3] (ft/s)	6.8	7.2	7.8	7.3	2.8	7.4	2.8

[1] Approach section is the location where the flow within the cross section is fully effective. The approach section for this bridge was determined to be 56 feet upstream of the edge of proposed bridge.
[2] Located at upstream face of proposed bridge along the embankment.
[3] Located at downstream face of proposed bridge opening.
[4] Area normal to channel centerline.
[5] This hydraulic analysis studied only the 2, 5, 10, 25, 50, 100, and 500 year event storms. No iteration was performed to calculate the design storm (defined as the road overtopping event).

TABLE 2. Hydraulic Data Sheet for the Existing Condition and Proposed Bridges at Site 5.

	Natural Conditions			56-Foot Multi-span		56-Foot Single-span	
	25-Year Flood	50-Year Flood	100-Year Flood	Conveyable Storm Event for Site[5]	100-Year Flood	Conveyable Storm Event for Site[5]	100-Year Flood
Discharge (ft^3/s)	1940	3070	4430	1940	4430	1940	4430
Recurrence Interval (yrs)	25	50	100	25	100	25	100
Approach Section H.W. Elevation with Natural Channel[1] (ft)	1350.15	1351.53	1351.92	1350.15	1351.92	1350.15	1351.92
Approach Section H.W. Elevation with Bridge[1]	-	-	-	1351.15	1352.83	1350.15	1352.00
Backwater (ft)	-	-	-	0.0	0.91	0.00	0.08
H.W. Elevation at Upstream Face of Bridge[2] (ft)	1350.60	1351.39	1351.80	1350.55	1352.41	1350.58	1352.40
H.W. Elevation at Downstream Face of Bridge[3] (ft)	1350.50	1351.77	1352.18	1350.37	1352.32	1350.50	1352.06
Waterway Area at Downstream Face of Bridge[3,4] (ft^2)	209.70	276.85	291.90	209.72	305.90	209.7	291.90
Average Velocity at Downstream Face of Bridge[3] (ft/s)	9.25	6.50	7.18	9.25	7.07	9.25	7.18

[1] Approach section is the location where the flow within the cross section is fully effective. The approach section for this bridge was determined to be 56 feet upstream of the edge of proposed bridge.
[2] Located at upstream face of proposed bridge along the embankment.
[3] Located at downstream face of proposed bridge opening.
[4] Area normal to channel centerline.
[5]This hydraulic analysis studied only the 2, 5, 10, 25, 50, 100, and 500 year event storms. No iteration was performed to calculate the design storm (defined as the road overtopping event).

SUMMARY

The conclusions drawn from the hydraulic analysis at each site are as follows:

Site 4		
Type	Conveyable Storm Event for Site (yr.)	Backwater Rise @ 100 yr. Event (ft.)
Multi-span (2 - 28’ spans)	25	0.36
Single-span	25	0.35

The multi-span and single-span structures passed the 10-year, 25 year, 50-year and 100-year storm events, respectively. The only structure that presents a “no-rise” water surface for the 100-year flood at the approach section to the structure is the free span structure. The multi-span caused a 0.36 foot water surface rise and the single-span caused a 0.35 foot water surface rise, respectively, at the approach section.

Site 5		
Type	Conveyable Storm Event for Site (yr.)	Backwater Rise @ 100 yr. Event (ft.)
Multi-span (2 – 28’ spans)	25	0.91
Single-span	25	0.08

The multi-span and single-span structures passed the 10-year, 25 year, 50-year and 100-year storm events, respectively. The only structure that presents a “no-rise” water surface for the 100-year flood at the approach section to the structure is the free span structure. The multi-span caused a 0.91 foot water surface rise and the single-span caused a 0.08 foot water surface rise, respectively, at the approach section.

Some depth of approach fill is used to raise the superstructure of the bridges. Raising the brides allows debris to pass underneath and limits the rise of the watersurface.

In addition to this hydraulic analysis there are various other factors that should be considered in assessing the bridge crossing. Below are two tables, Table 4 - “General Pros and Cons of Crossing type”, and Table 5 - “General Considerations of Crossing Type”. Additionally,

Table 6 includes calculations of disturbed areas and materials for each crossing and each alternative within the ordinary high water (OHW) and top-of-bank to top-of-bank limits.

Table 4 - GENERAL PROS AND CONS OF CROSSING TYPE		
Crossing Type	Pros	Cons
Ford	- no change in existing hydraulic conditions - satisfies “no-rise” condition - lowest construction and maintenance costs	- crossing is not available during a high hydraulic event - significant disturbance to bed and bank habitat during construction
Culvert	- crossing is available during a low hydraulic event - lowest construction and maintenance costs	- crossing is not available during a high hydraulic event - significant disturbance to the bed and bank habitat during construction
Free Span	- crossing is available during high water events - satisfies "no-rise" situation	- moderate upland habitat disturbance during construction and lifecycle - very high cost to benefit ratio - high maintenance cost - visual impact structure is out of place for environment
Multi-span	- crossing is available during high water events - moderate construction and maintenance costs	- moderate disturbance to bed and bank habitat during construction due to excavation and foundation installation and equipment
Single-span	- crossing is available during high water events - moderate construction and maintenance costs	- moderate disturbance to bed and bank habitat during construction due to excavation and foundation installation and equipment

Table 5 - GNEREAL CONSIDERATION OF CROSSING TYPE	
Ford	- will pass the 100-year flood event - a "no-rise" will result for the 100-year flood event - will require excavation of bank material to reduce slopes and excavation below existing ground to accommodate armoring and achieve an all-weather road - made of articulated concrete block mattress cabled together - increase in hydraulic opening - increase in hydraulic opening
Culvert	- excavation is required in the creek channel for a culvert bottom or footings - fill is required at the ends of the culverts to avoid removing native material only to replace it with a concrete structure that is buried - spread footings or solid bottom culvert
Free Span	- chose a +/-3' clearance from the existing ground to allow any maintenance that might be required, passes a larger hydraulic event, avoids maintenance problems if the structure is off the ground surface, caused by acidity and high water / debris - fill is required at each end of the span to accommodate the higher deck elevation - pile foundation assumed - truss type structure chosen to minimize beam depth under the bridge
Multi-span	- minimal excavation is required for abutments and disturbance in the creek channel due to pile installation - precast, pre-stressed concrete slabs chosen because they are simple, inexpensive and readily available - pile foundation assumed because geotechnical report indicated low bearing capacity on the surface soil, but will require further geotechnical investigation, assumed 40' deep pile - precast slabs assumed to be 15" thick to minimize hydraulic interference
Single-span	- minimal excavation is required for abutments and disturbance in the creek channel due to pile installation - precast, pre-stressed concrete slabs chosen because they are simple, inexpensive and readily available - pile foundation assumed because geotechnical report indicated low bearing capacity on the surface soil, but will require further geotechnical investigation, assumed 40' deep pile - precast slabs assumed to be 18" thick to minimize hydraulic interference

Additionally, the table below includes calculations of disturbed areas and materials for each crossing and each alternative within the ordinary high water (OHW) and top-of-bank to top-of-bank limits

TABLE 6 - DISTURBED CHANNEL QUANTITIES

Site 4	Outside OHW								Inside OHW			
	Outside Top of Bank				Within Top of Bank							
Crossing Type	Cut Area (SF)	Fill Area (SF)	Fill Vol. (CY)*	Cut Vol. (CY)*	Cut Area (SF)	Fill Area (SF)	Fill Vol. (CY)*	Cut Vol. (CY)*	Cut Area (SF)	Fill Area (SF)	Fill Vol. (CY)*	Cut Vol. (CY)*
Ford	0	0	0	0	1792	1200	62	98	962	962	46	46
Culvert	0	0	0	0	421	1113	39	38	1337	1337	24	37
Free Span	0	4550	520	0	0	0	0	0	0	0	0	0
Multi-Span	0	1140	90	0	96	96	27	15	48	48	10	4
Single Span	0	1510	150	0	96	96	10	10	32	32	6	5

Site 5	Outside OHW								Inside OHW			
	Outside Top of Bank				Within Top of Bank							
Crossing Type	Cut Area (SF)	Fill Area (SF)	Fill Vol. (CY)*	Cut Vol. (CY)*	Cut Area (SF)	Fill Area (SF)	Fill Vol. (CY)*	Cut Vol. (CY)*	Cut Area (SF)	Fill Area (SF)	Fill Vol. (CY)*	Cut Vol. (CY)*
Ford	0	0	0	0	2400	2400	130	319	1200	1200	45	45
Culvert	0	0	0	0	838	1698	35	112	920	1096	10	12
Free Span	0	4550	500	0	0	0	0	0	0	0	0	0
Multi-Span	0	1140	90	0	160	96	27	15	48	48	20	15
Single Span	0	1510	150	0	160	160	10	10	24	24	10	10

*Displaced volume includes fill and excavation of soil or other material

In addition to the hydraulic parameters addressed in this report, the selection of the best solution for a creek crossing, may also consider cost, accessibility, environmental impact, and other relevant factors.

Rock armoring (riprap) was considered in the volume calculations to protect both the single-span and multi-span bridges. This armoring would occur at the abutments and piers to protect the long term life of the structure. Below are typical details of the rock armoring that would be used. If larger rock (Based on Velocity) is un-available grouting would be required.

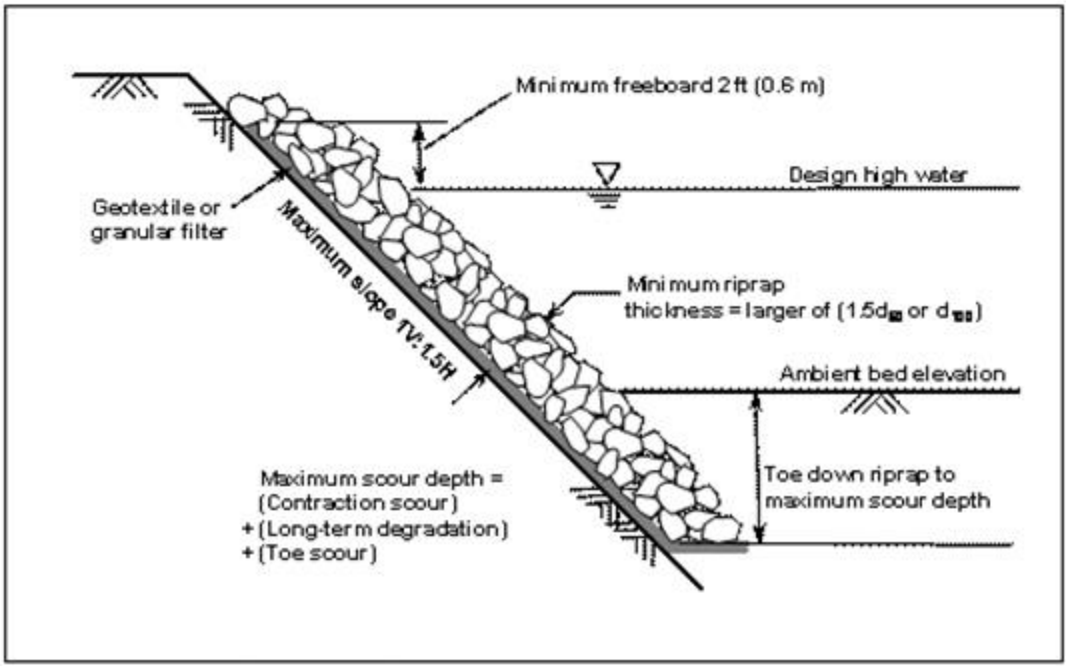

Figure 1. Riprap revetment with buried toe.

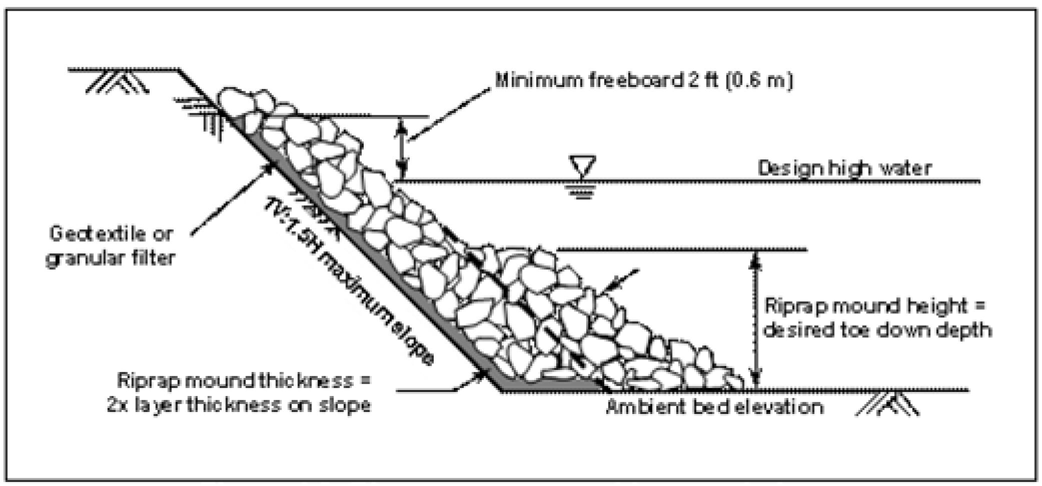

Figure 2. Riprap revetment with mounded toe.

REFERENCES

Federal Emergency Management Agency (FEMA), Flood Insurance Rate Map Nos. 06069C425D, 06069C450D, 06069C550D and 06069C570D, San Benito County, California (Uninc. Area) Revised April 16, 2009.

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Waananen, A.O. and Crippen, J.R., 1977, Magnitude and frequency of floods in California: U.S. Geological Survey Water-Resources Investigations Report 77-21, 102p.

CONCEPTUAL CROSSING 4 - FORD COST ESTIMATE

PROJECT				CLIENT	
Panoche Valley Solar Farm				ENERGY RENEWAL PARTNERS	
ALTERNATIVE: Crossing 4 Ford		DATE: 2/13/2014		Prepared by: WHPACIFIC, INC	

	ITEM DESCRIPTION	UNIT	AMOUNT	UNIT COST	TOTAL
	MOBILIZATION	LS	All	8.0% Biddable	$ 3,262.80
	EXCAVATION	CUYD	165.00	$ 45.00	$ 7,425.00
	3/4 INCH - 0 AGGREGATE BASE	CUYD	40.00	$ 12.00	$ 480.00
	ARTICULATING CONCRETE BLOCK MATTRESS	SQFT	2160.00	$ 15.00	$ 32,400.00
	EMBANKMENT GEOTEXTILE	SQYD	240.00	$ 2.00	$ 480.00
SUBTOTAL, BIDDABLE ITEMS					**$ 44,047.80**
	CONTINGENCIES, for all work listed			25.0%	$ 11,011.95
CONSTRUCTION COST					**$ 55,059.75**

CONCEPTUAL CROSSING 4 - CULVERT COST ESTIMATE

PROJECT Panoche Valley Solar Farm				CLIENT ENERGY RENEWAL PARTNERS	
ALTERNATIVE Crossing 4 Culvert			DATE 2/13/2014	Prepared by: WHPACIFIC, INC	

ITEM DESCRIPTION		UNIT	AMOUNT	UNIT COST	TOTAL
	MOBILIZATION	LS	All	8.0% Biddable	$ 11,318.40
	EMBANKMENT	CUYD	45.00	$ 25.00	$ 1,125.00
	STRUCTURE EXCAVATION	CUYD	125.00	$ 45.00	$ 5,625.00
	REINFORCEMENT	LS	All	$ 9,480.00	$ 9,480.00
	REINFORCED CONCRETE BOX CULVERT	FOOT	96.00	$ 700.00	$ 67,200.00
	WINGWALLS AND APRONS	CUYD	60.00	$ 830.00	$ 49,800.00
	W BEAM STEEL RAIL	LS	All	$ 8,250.00	$ 8,250.00
SUBTOTAL, BIDDABLE ITEMS					**$ 152,798.40**
	CONTINGENCIES, for all work listed			25.0%	$ 38,199.60
CONSTRUCTION COST					**$ 190,998.00**

CONCEPTUAL CROSSING 4 - FREE SPAN COST ESTIMATE

PROJECT				CLIENT	
Panoche Valley Solar Farm				ENERGY RENEWAL PARTNERS	
ALTERNATIVE			DATE	Prepared by:	
Crossing 4 - 275' Free Span Bridge			2/13/2014	WHPACIFIC, INC	
	ITEM DESCRIPTION	UNIT	AMOUNT	UNIT COST	TOTAL
	MOBILIZATION	LS	All	8.0% Biddable	$ 114,957.60
	FURNISH PILE DRIVING EQUIPMENT	LS	All	$ 18,000.00	$ 18,000.00
	FURNISH PP 12-3/4 X 0.375 STEEL PILES	FOOT	320.00	$ 45.00	$ 14,400.00
	DRIVE PP 12-3/4 X 0.375 STEEL PILES	EACH	8.00	$ 650.00	$ 5,200.00
	GENERAL STRUCTURAL CONCRETE, CLASS 3300	LS	All	$ 17,850.00	$ 17,850.00
	REINFORCEMENT	LS	All	$ 5,520.00	$ 5,520.00
	PREFABRICATED STEEL TRUSS	FOOT	275.00	$ 4,800.00	$ 1,320,000.00
	FURNISH CRANE FOR LIFTING TRUSS	LS	All	$ 50,000.00	$ 50,000.00
	ASHPALT PAVING	TON	60.00	$ 100.00	$ 6,000.00
SUBTOTAL, BIDDABLE ITEMS					**$ 1,551,927.60**
	CONTINGENCIES, for all work listed			25.0%	$ 387,981.90
CONSTRUCTION COST					**$ 1,939,909.50**

CONCEPTUAL CROSSING 4 - MULTI-SPAN BRIDGE COST ESTIMATE

PROJECT			CLIENT	
Panoche Valley Solar Farm			ENERGY RENEWAL PARTNERS	
ALTERNATIVE		DATE	Prepared by:	
Crossing 4 - 2 Span 56' Bridge		2/13/2014	WHPACIFIC, INC	

ITEM DESCRIPTION	UNIT	AMOUNT	UNIT COST	TOTAL
MOBILIZATION	LS	All	8.0% Biddable	$ 9,560.40
STRUCTURE EXCAVATION	CUYD	75.00	$ 45.00	$ 3,375.00
FURNISH PILE DRIVING EQUIPMENT	LS	All	$ 18,000.00	$ 18,000.00
FURNISH PP 12-3/4 X 0.375 STEEL PILES	FOOT	360.00	$ 45.00	$ 16,200.00
DRIVE PP 12-3/4 X 0.375 STEEL PILES	EACH	9.00	$ 650.00	$ 5,850.00
GENERAL STRUCTURAL CONCRETE, CLASS 3300	LS	All	$ 21,000.00	$ 21,000.00
REINFORCEMENT	LS	All	$ 6,360.00	$ 6,360.00
15 INCH PRECAST PRESTRESSED SLABS	FOOT	224.00	$ 180.00	$ 40,320.00
W BEAM STEEL RAIL	LS	All	$ 8,400.00	$ 8,400.00
SUBTOTAL, BIDDABLE ITEMS				**$ 129,065.40**
CONTINGENCIES, for all work listed			25.0%	$ 32,266.35
CONSTRUCTION COST				**$ 161,331.75**

CONCEPTUAL CROSSING 4 - SINGLE SPAN BRIDGE COST ESTIMATE

PROJECT				CLIENT	
Panoche Valley Solar Farm				ENERGY RENEWAL PARTNERS	
ALTERNATIVE Crossing 4 - Single Span 56' Bridge			DATE 2/13/2014	Prepared by: WHPACIFIC, INC	

	ITEM DESCRIPTION	UNIT	AMOUNT	UNIT COST	TOTAL
	MOBILIZATION	LS	All	8.0% Biddable	$ 9,174.00
	STRUCTURE EXCAVATION	CUYD	65.00	$ 45.00	$ 2,925.00
	FURNISH PILE DRIVING EQUIPMENT	LS	All	$ 18,000.00	$ 18,000.00
	FURNISH PP 12-3/4 X 0.375 STEEL PILES	FOOT	300.00	$ 45.00	$ 13,500.00
	DRIVE PP 12-3/4 X 0.375 STEEL PILES	EACH	10.00	$ 650.00	$ 6,500.00
	GENERAL STRUCTURAL CONCRETE, CLASS 3300	LS	All	$ 15,750.00	$ 15,750.00
	REINFORCEMENT	LS	All	$ 4,800.00	$ 4,800.00
	26 INCH PRECAST PRESTRESSED SLABS	FOOT	224.00	$ 200.00	$ 44,800.00
	W BEAM STEEL RAIL	LS	All	$ 8,400.00	$ 8,400.00
SUBTOTAL, BIDDABLE ITEMS					**$ 123,849.00**
	CONTINGENCIES, for all work listed			25.0%	$ 30,962.25
CONSTRUCTION COST					**$ 154,811.25**

CONCEPTUAL CROSSING 5 - FORD COST ESTIMATE

PROJECT				CLIENT	
Panoche Valley Solar Farm				ENERGY RENEWAL PARTNERS	
ALTERNATIVE			DATE	Prepared by:	
Crossing 5 Ford			2/13/2014	WHPACIFIC, INC	
ITEM DESCRIPTION		UNIT	AMOUNT	UNIT COST	TOTAL
	MOBILIZATION	LS	All	8.0% Biddable	$ 4,736.80
	EXCAVATION	CUYD	320.00	$ 45.00	$ 14,400.00
	3/4 INCH - 0 AGGREGATE BASE	CUYD	55.00	$ 12.00	$ 660.00
	ARTICULATING CONCRETE BLOCK MATTRESS	SQFT	2900.00	$ 15.00	$ 43,500.00
	EMBANKMENT GEOTEXTILE	SQYD	325.00	$ 2.00	$ 650.00
SUBTOTAL, BIDDABLE ITEMS					**$ 63,946.80**
	CONTINGENCIES, for all work listed			25.0%	$ 15,986.70
CONSTRUCTION COST					**$ 79,933.50**

CONCEPTUAL CROSSING 5 - CULVERT COST ESTIMATE

PROJECT **Panoche Valley Solar Farm**				CLIENT **ENERGY RENEWAL PARTNERS**	
ALTERNATIVE **Crossing 5 Culvert**			DATE **2/13/2014**	Prepared by: **WHPACIFIC, INC**	
ITEM DESCRIPTION	**UNIT**	**AMOUNT**	**UNIT COST**	**TOTAL**	
MOBILIZATION	LS	All	8.0% Biddable	$ 11,441.20	
EMBANKMENT	CUYD	5.00	$ 25.00	$ 125.00	
STRUCTURE EXCAVATION	CUYD	50.00	$ 45.00	$ 2,250.00	
REINFORCEMENT	LS	All	$ 10,440.00	$ 10,440.00	
REINFORCED CONCRETE BOX CULVERT	FOOT	80.00	$ 850.00	$ 68,000.00	
WINGWALLS AND APRONS	CUYD	65.00	$ 830.00	$ 53,950.00	
W BEAM STEEL RAIL	LS	All	$ 8,250.00	$ 8,250.00	
SUBTOTAL, BIDDABLE ITEMS				**$ 154,456.20**	
CONTINGENCIES, for all work listed			25.0%	$ 38,614.05	
CONSTRUCTION COST				**$ 193,070.25**	

CONCEPTUAL CROSSING 5 - FREE SPAN COST ESTIMATE

PROJECT			CLIENT	
Panoche Valley Solar Farm			**ENERGY RENEWAL PARTNERS**	
ALTERNATIVE **Crossing 5 - 275' Free Span Bridge**		DATE **2/13/2014**	Prepared by: **WHPACIFIC, INC**	

ITEM DESCRIPTION	UNIT	AMOUNT	UNIT COST	TOTAL
MOBILIZATION	LS	All	8.0% Biddable	$ 114,957.60
FURNISH PILE DRIVING EQUIPMENT	LS	All	$ 18,000.00	$ 18,000.00
FURNISH PP 12-3/4 X 0.375 STEEL PILES	FOOT	320.00	$ 45.00	$ 14,400.00
DRIVE PP 12-3/4 X 0.375 STEEL PILES	EACH	8.00	$ 650.00	$ 5,200.00
GENERAL STRUCTURAL CONCRETE, CLASS 3300	LS	All	$ 17,850.00	$ 17,850.00
REINFORCEMENT	LS	All	$ 5,520.00	$ 5,520.00
PREFABRICATED STEEL TRUSS	FOOT	275.00	$ 4,800.00	$ 1,320,000.00
FURNISH CRANE FOR LIFTING TRUSS	LS	All	$ 50,000.00	$ 50,000.00
ASHPALT PAVING	TON	60.00	$ 100.00	$ 6,000.00
SUBTOTAL, BIDDABLE ITEMS				**$ 1,551,927.60**
CONTINGENCIES, for all work listed			25.0%	$ 387,981.90
CONSTRUCTION COST				**$ 1,939,909.50**

CONCEPTUAL CROSSING 5 - MULTI-SPAN BRIDGE COST ESTIMATE

PROJECT		CLIENT
Panoche Valley Solar Farm		ENERGY RENEWAL PARTNERS
ALTERNATIVE	DATE	Prepared by:
Crossing 5 - 2 Span 54' Bridge	2/13/2014	WHPACIFIC, INC

	ITEM DESCRIPTION	UNIT	AMOUNT	UNIT COST	TOTAL
	MOBILIZATION	LS	All	8.0% Biddable	$ 9,385.20
	STRUCTURE EXCAVATION	CUYD	65.00	$ 45.00	$ 2,925.00
	FURNISH PILE DRIVING EQUIPMENT	LS	All	$ 18,000.00	$ 18,000.00
	FURNISH PP 12-3/4 X 0.375 STEEL PILES	FOOT	360.00	$ 45.00	$ 16,200.00
	DRIVE PP 12-3/4 X 0.375 STEEL PILES	EACH	9.00	$ 650.00	$ 5,850.00
	GENERAL STRUCTURAL CONCRETE, CLASS 3300	LS	All	$ 21,000.00	$ 21,000.00
	REINFORCEMENT	LS	All	$ 6,360.00	$ 6,360.00
	15 INCH PRECAST PRESTRESSED SLABS	FOOT	216.00	$ 180.00	$ 38,880.00
	W BEAM STEEL RAIL	LS	All	$ 8,100.00	$ 8,100.00
SUBTOTAL, BIDDABLE ITEMS					**$ 126,700.20**
	CONTINGENCIES, for all work listed			25.0%	$ 31,675.05
CONSTRUCTION COST					**$ 158,375.25**

CONCEPTUAL CROSSING 5 - SINGLE SPAN BRIDGE COST ESTIMATE

PROJECT **Panoche Valley Solar Farm**				CLIENT **ENERGY RENEWAL PARTNERS**	
ALTERNATIVE **Crossing 5 - Single Span 54' Bridge**		DATE **2/13/2014**		Prepared by: **WHPACIFIC, INC**	
ITEM DESCRIPTION	**UNIT**	**AMOUNT**	**UNIT COST**	**TOTAL**	
MOBILIZATION	LS	All	8.0% Biddable	$	9,022.00
STRUCTURE EXCAVATION	CUYD	65.00	$ 45.00	$	2,925.00
FURNISH PILE DRIVING EQUIPMENT	LS	All	$ 18,000.00	$	18,000.00
FURNISH PP 12-3/4 X 0.375 STEEL PILES	FOOT	300.00	$ 45.00	$	13,500.00
DRIVE PP 12-3/4 X 0.375 STEEL PILES	EACH	10.00	$ 650.00	$	6,500.00
GENERAL STRUCTURAL CONCRETE, CLASS 3300	LS	All	$ 15,750.00	$	15,750.00
REINFORCEMENT	LS	All	$ 4,800.00	$	4,800.00
26 INCH PRECAST PRESTRESSED SLABS	FOOT	216.00	$ 200.00	$	43,200.00
W BEAM STEEL RAIL	LS	All	$ 8,100.00	$	8,100.00
SUBTOTAL, BIDDABLE ITEMS				**$**	**121,797.00**
CONTINGENCIES, for all work listed			25.0%	$	30,449.25
CONSTRUCTION COST				**$**	**152,246.25**

Panoche Valley Solar Farm

San Benito County, California

Stream Crossing Alternative Study & Hydraulic Report

Prepared for:

Energy Renewal Partners
305 Camp Craft Rd, Suite 575
West Lake Hills, TX 78746

Prepared by:

WHPacific, Inc.
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Job No. 035916

Project Engineer:
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Design Engineers:
Structural – Paul Tappana, P.E.
Hydraulic – John Marks, P.E., Devin Doring, E.I.T.

REGISTERED PROFESSIONAL ENGINEER
DANIEL L. BOULTINGHOUSE
NO. C 61165
EXP. 6/30/15
CIVIL
STATE OF CALIFORNIA

Original: February 19, 2014

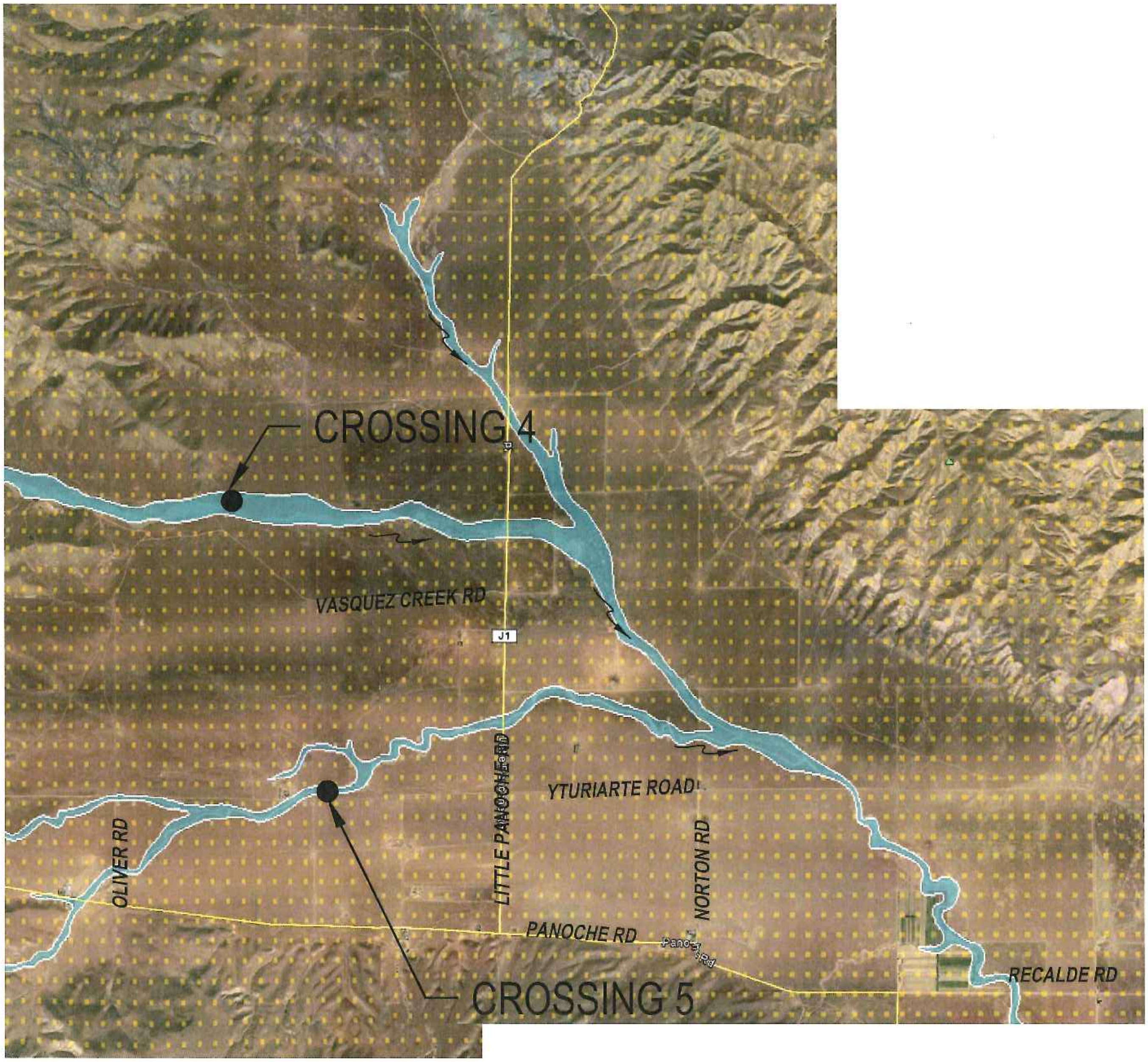
INTRODUCTION

This report is a continuation of a previous study and addresses the hydrologic and hydraulic research and analysis that was conducted as part of the Panoche Valley Solar Facility (PVSF) project in San Benito County, California. The original objective of this effort was to analyze the existing conditions and document the associated conditions with five proposed bridge locations. A hydraulic analysis was performed for the purpose of designing bridge structures and at grade fords at creek crossings on the PVSF project that will provide emergency access (fire trucks and/or rescue personnel) to the entire facility during a 100 year flood event. Following size reductions and modifications to the PVSF project, two crossings of Waters of the U.S. are needed for the project.

Five bridge models are being analyzed at both creek crossing (Figure1). The first bridge model is a ford crossing that requires laying back the slope and crossing at grade. The second bridge model is a multi-barreled, concrete box culvert structure. The third bridge model is a free span bridge that has abutments 100 feet distant from the top of bank on either side of the channel. This structure is intended to span the channel and both overbank areas. It will, however require approach fills at both ends to allow for a minimum of 3 feet of clearance below the bridge superstructure. The fourth bridge model is a multi-span structure with abutments near the top of channel banks and a pier in the channel. The fifth bridge option is a single span bridge with abutments near the top of channel banks.

REGULATORY STANDARDS

The PVSF project is within a regulatory Federal Emergency Management Agency (FEMA) floodplain. The crossing sites are located within a Zone A region which is defined as "Special flood hazard areas subject to inundation by the 1% annual chance flood, no base flood elevation determined". If a particular scenario demonstrates a no-rise scenario, regulatory standards will easily be satisfied. However, if backwater occurs, negotiations with the appropriate authorities, San Benito County and FEMA, will be required. FEMA may defer to the local authorities. It may be possible to negotiate allowing a backwater rise, most likely limited to one foot.



WHPacific

SHEET NUMBER		DRAWING INFO	SHEET INFO		
FIG 1	PANOCHE VALLEY SOLAR FACILITY VICINITY MAP SAN BENITO COUNTY, CALIFORNIA	035916-VIC NTS	DRAWN	DLB	WHPacific
			CHECKED	DLB	
			LAST EDIT	2/18/2014	
			PLOT DATE	2/18/2014	

BASIN RESEARCH

Three major creeks flow through the PVSF project. A unnamed creek flows from the northern edge of the project and joins Las Aguilas Creek near the center of the project. Panoche Creek flows along the southern edge of the project and forms a confluence with Las Aguilas Creek near the southeast corner of the project (Figure 1). Las Aguilas Creek flows from northwest to southeast and has a drainage basin of approximately 9.9 square miles above crossing site numbered 4. Panoche Creek flows from west to east and has a drainage basin of approximately 44.7 square miles above crossing site 5. The Las Aguilas Creek watershed varies in elevation from about 1415 feet at crossing site 4 to a maximum of 3639 feet. The Panoche Creek watershed varies in elevation from about 1345 feet at crossing site 5 to a maximum of 3969 feet. The watershed is subject to winter storms in which precipitation is mainly in the form of rain. High flows if they occur typically occur in the winter months.

SITE INVESTIGATION

A site investigation of the study area was conducted by John R. Marks and Paul Tappana of WHPacific on June 27, 2012 and then again on September 24, 2013. The purpose of the site investigation was to review the sites for hydrologic, hydraulic and scour concerns that may affect the proposed creek crossings. Survey mapping of the area was completed by WHPacific survey crew. The survey also included a digital terrain model (DTM) that was used to develop cross sections needed in the hydraulic modeling. Google Earth data was used to supplement elevation data for the extensive floodplain outside the extents of the survey. The following observations were made during the site visit.

1. **Lateral Channel Stability**
   The creek alignment meanders slightly within moderately moving channel boundaries of the adjacent grass land.
2. **Aggradation /Degradation**
   The relatively low slope condition of the creek channel and the steepness of the channel's banks indicate that both aggradation and degradation will be unlikely.
3. **Manning's *n***
   The left and right overbank areas through all reaches consist of grassland. A Manning's n value of 0.030 was assigned for this condition. The main channel throughout consists of silt, sand and gravel with scattered cobbles. A Manning's n value of 0.030 was assigned for the channel.
4. **Riprap**
   No riprap is present.
5. **Bed Material**
   The bed material was observed to be silt, sand and gravel with scattered cobbles with an estimated D_{50} of 0.1 mm.
6. **Evidence of Scour**
   There is some evidence of isolated scour on the outside of bends on both creeks.

7. **Abutment Alignment**
   There are no bridges at the proposed bridge sites.
8. **Hydraulic Controls**
   No hydraulic controls are present.
9. **High Water Marks**
   No high water marks were observed.
10. **Debris**
    The woody debris potential for the watershed appears to be moderate to high.

Based on this information WHPacific also looked at long term scour and have included additional removal and fill to help stabilize the long term features of the crossings due to erosion.

HYDROLOGY

The peak discharges for these ungauged watersheds have been taken from a USGS online application called StreamStats for California (http://streamstats.usgs.gov/california.html). Storm event flows were provided at standard intervals. The discharges used in the hydraulic analysis of the proposed crossing structures are provided below:

Crossing Site 4

Q_2 = 25 cfs
Q_5 = 115 cfs
Q_{10} = 243 cfs
Q_{25} = 498 cfs
Q_{50} = 793 cfs
Q_{100} = 1170 cfs
Q_{500} = 2470 cfs

Crossing Site 5

Q_2 = 105 cfs
Q_5 = 473 cfs
Q_{10} = 970 cfs
Q_{25} = 1940 cfs
Q_{50} = 3070 cfs
Q_{100} = 4430 cfs
Q_{500} = 9090 cfs

HYDRAULICS

The US Army Corps of Engineers, Hydrologic Engineering Centers River Analysis System computer program (HEC- RAS Version 4.1.0) was used to compute the channel hydraulics. Hydraulic models were developed for the "natural channel" conditions of the sites and the requested bridge/culvert alternatives. Ten stream cross-sections were used to develop the hydraulic models at sites 4 and 5. The cross-sections were selected to adequately model flow through the site locations for both Las Aguilas Creek and Panoche Creek.

The proposed alternatives, except for the free span bridges, were modeled to provide maximum conveyance through the sites with using minimal approach fill. The single and multi-span structures were modeled with approach fills to elevate the superstructure above the overbank area. The water surface elevations for each model were calculated using the provided flow data from StreamStats. It should be noted that on the bridge profile sheets where water surface elevations are depicted, that some storms which are higher than the stated maximum conveyable storm for a site may appear as though it can "fit" under the bridge or culvert. However, what is not seen is that these storms cover the approach roadway past the extents of the profile window. Detailed printouts of the results are provided in the Appendix.

TABLE 1. Hydraulic Data Sheet for the Existing Condition and Proposed Bridges at Site 4.

	Natural Conditions			56-Foot Multi-span		56-Foot Single-span	
	25-Year Flood	50-Year Flood	100-Year Flood	Conveyable Storm Event for Site[5]	100-Year Flood	Conveyable Storm Event for Site[5]	100-Year Flood
Discharge (ft^3/s)	498	793	1170	498	1170	498	1170
Recurrence Interval (yrs)	25	50	100	25	100	25	100
Approach Section H.W. Elevation with Natural Channel[1] (ft)	1415.98	1416.38	1416.74	1415.98	1416.74	1415.98	1416.74
Approach Section H.W. Elevation with Bridge[1]	-	-	-	1416.12	1417.10	1416.07	1417.09
Backwater (ft)	-	-	-	0.14	0.36	0.09	0.35
H.W. Elevation at Upstream Face of Bridge[2] (ft)	1415.34	1415.75	1416.19	1415.32	1417.15	1415.28	1417.14
H.W. Elevation at Downstream Face of Bridge[3] (ft)	1414.90	1415.37	1415.79	1414.90	1417.05	1414.84	1417.03
Waterway Area at Downstream Face of Bridge[3,4] (ft^2)	73.5	109.4	149.5	68.0	413.1	67.4	415.9
Average Velocity at Downstream Face of Bridge[3] (ft/s)	6.8	7.2	7.8	7.3	2.8	7.4	2.8

[1] Approach section is the location where the flow within the cross section is fully effective. The approach section for this bridge was determined to be 56 feet upstream of the edge of proposed bridge.
[2] Located at upstream face of proposed bridge along the embankment.
[3] Located at downstream face of proposed bridge opening.
[4] Area normal to channel centerline.
[5] This hydraulic analysis studied only the 2, 5, 10, 25, 50, 100, and 500 year event storms. No iteration was performed to calculate the design storm (defined as the road overtopping event).

TABLE 2. Hydraulic Data Sheet for the Existing Condition and Proposed Bridges at Site 5.

	Natural Conditions			56-Foot Multi-span		56-Foot Single-span	
	25-Year Flood	50-Year Flood	100-Year Flood	Conveyable Storm Event for Site[5]	100-Year Flood	Conveyable Storm Event for Site[5]	100-Year Flood
Discharge (ft^3/s)	1940	3070	4430	1940	4430	1940	4430
Recurrence Interval (yrs)	25	50	100	25	100	25	100
Approach Section H.W. Elevation with Natural Channel[1] (ft)	1350.15	1351.53	1351.92	1350.15	1351.92	1350.15	1351.92
Approach Section H.W. Elevation with Bridge[1]	-	-	-	1351.15	1352.83	1350.15	1352.00
Backwater (ft)	-	-	-	0.0	0.91	0.00	0.08
H.W. Elevation at Upstream Face of Bridge[2] (ft)	1350.60	1351.39	1351.80	1350.55	1352.41	1350.58	1352.40
H.W. Elevation at Downstream Face of Bridge[3] (ft)	1350.50	1351.77	1352.18	1350.37	1352.32	1350.50	1352.06
Waterway Area at Downstream Face of Bridge[3,4] (ft^2)	209.70	276.85	291.90	209.72	305.90	209.7	291.90
Average Velocity at Downstream Face of Bridge[3] (ft/s)	9.25	6.50	7.18	9.25	7.07	9.25	7.18

[1] Approach section is the location where the flow within the cross section is fully effective. The approach section for this bridge was determined to be 56 feet upstream of the edge of proposed bridge.
[2] Located at upstream face of proposed bridge along the embankment.
[3] Located at downstream face of proposed bridge opening.
[4] Area normal to channel centerline.
[5]This hydraulic analysis studied only the 2, 5, 10, 25, 50, 100, and 500 year event storms. No iteration was performed to calculate the design storm (defined as the road overtopping event).

SUMMARY

The conclusions drawn from the hydraulic analysis at each site are as follows:

Site 4		
Type	Conveyable Storm Event for Site (yr.)	Backwater Rise @ 100 yr. Event (ft.)
Multi-span (2 - 28' spans)	25	0.36
Single-span	25	0.35

The multi-span and single-span structures passed the 10-year, 25 year, 50-year and 100-year storm events, respectively. The only structure that presents a "no-rise" water surface for the 100-year flood at the approach section to the structure is the free span structure. The multi-span caused a 0.36 foot water surface rise and the single-span caused a 0.35 foot water surface rise, respectively, at the approach section.

Site 5		
Type	Conveyable Storm Event for Site (yr.)	Backwater Rise @ 100 yr. Event (ft.)
Multi-span (2 – 28' spans)	25	0.91
Single-span	25	0.08

The multi-span and single-span structures passed the 10-year, 25 year, 50-year and 100-year storm events, respectively. The only structure that presents a "no-rise" water surface for the 100-year flood at the approach section to the structure is the free span structure. The multi-span caused a 0.91 foot water surface rise and the single-span caused a 0.08 foot water surface rise, respectively, at the approach section.

Some depth of approach fill is used to raise the superstructure of the bridges. Raising the brides allows debris to pass underneath and limits the rise of the watersurface.

In addition to this hydraulic analysis there are various other factors that should be considered in assessing the bridge crossing. Below are two tables, Table 4 - "General Pros and Cons of Crossing type", and Table 5 - "General Considerations of Crossing Type". Additionally, Table 6 includes calculations of disturbed areas and materials for each crossing and each alternative within the ordinary high water (OHW) and top-of-bank to top-of-bank limits.

Table 4 - GENERAL PROS AND CONS OF CROSSING TYPE		
Crossing Type	Pros	Cons
Ford	- no change in existing hydraulic conditions - satisfies “no-rise” condition - lowest construction and maintenance costs	- crossing is not available during a high hydraulic event - significant disturbance to creek bed and bank habitat during construction
Culvert	- crossing is available during a low hydraulic event - lowest construction and maintenance costs	- crossing is not available during a high hydraulic event - significant disturbance to the creek bed and bank habitat during construction
Free Span	- crossing is available during high water events - satisfies "no-rise" situation	- moderate upland habitat disturbance during construction and lifecycle - very high cost to benefit ratio - high maintenance cost - visual impact structure is out of place for environment - other specie impacts such as perching habitat for raptors and significant shading.
Multi-span	- crossing is available during high water events - moderate construction and maintenance costs	- moderate disturbance to bed and bank habitat during construction due to excavation and foundation installation and equipment
Single-span	- crossing is available during high water events - moderate construction and maintenance costs	- low disturbance to bed and bank habitat during construction due to excavation and foundation installation and equipment

Table 5 - GNEREAL CONSIDERATION OF CROSSING TYPE	
Ford	- will pass the 100-year flood event - a "no-rise" will result for the 100-year flood event - will require excavation of bank material to reduce slopes and excavation below existing ground to accommodate armoring and achieve an all-weather road - made of articulated concrete block mattress cabled together - increase in hydraulic opening - increase in hydraulic opening
Culvert	- excavation is required in the creek channel for a culvert bottom or footings - fill is required at the ends of the culverts to avoid removing native material only to replace it with a concrete structure that is buried - spread footings or solid bottom culvert
Free Span	- chose a +/-3' clearance from the existing ground to allow any maintenance that might be required, passes a larger hydraulic event, avoids maintenance problems if the structure is off the ground surface, caused by acidity and high water / debris - fill is required at each end of the span to accommodate the higher deck elevation - pile foundation assumed - truss type structure chosen to minimize beam depth under the bridge
Multi-span	- minimal excavation is required for abutments and disturbance in the creek channel due to pile installation - precast, pre-stressed concrete slabs chosen because they are simple, inexpensive and readily available - pile foundation assumed because geotechnical report indicated low bearing capacity on the surface soil, but will require further geotechnical investigation, assumed 40' deep pile - precast slabs assumed to be 15" thick to minimize hydraulic interference
Single-span	- minimal excavation is required for abutments and disturbance in the creek channel due to pile installation - precast, pre-stressed concrete slabs chosen because they are simple, inexpensive and readily available - pile foundation assumed because geotechnical report indicated low bearing capacity on the surface soil, but will require further geotechnical investigation, assumed 40' deep pile - precast slabs assumed to be 18" thick to minimize hydraulic interference

Additionally, the table below includes calculations of disturbed areas and materials for each crossing and each alternative within the ordinary high water (OHW) and top-of-bank to top-of-bank limits

TABLE 6 - DISTURBED CHANNEL QUANTITIES

Site 4	Outside OHW								Inside OHW			
	Outside Top of Bank				Within Top of Bank							
Crossing Type	Cut Area (SF)	Fill Area (SF)	Fill Vol. (CY)*	Cut Vol. (CY)*	Cut Area (SF)	Fill Area (SF)	Fill Vol. (CY)*	Cut Vol. (CY)*	Cut Area (SF)	Fill Area (SF)	Fill Vol. (CY)*	Cut Vol. (CY)*
Ford	0	0	0	0	1792	1200	62	98	962	962	46	46
Culvert	0	0	0	0	421	1113	39	38	1337	1337	24	37
Free Span	0	4550	520	0	0	0	0	0	0	0	0	0
Multi-Span	0	1140	90	0	96	96	27	15	48	48	10	4
Single Span	0	1510	150	0	96	96	10	10	32	32	6	5

Site 5	Outside OHW								Inside OHW			
	Outside Top of Bank				Within Top of Bank							
Crossing Type	Cut Area (SF)	Fill Area (SF)	Fill Vol. (CY)*	Cut Vol. (CY)*	Cut Area (SF)	Fill Area (SF)	Fill Vol. (CY)*	Cut Vol. (CY)*	Cut Area (SF)	Fill Area (SF)	Fill Vol. (CY)*	Cut Vol. (CY)*
Ford	0	0	0	0	2400	2400	130	319	1200	1200	45	45
Culvert	0	0	0	0	838	1698	35	112	920	1096	10	12
Free Span	0	4550	500	0	0	0	0	0	0	0	0	0
Multi-Span	0	1140	90	0	160	96	27	15	48	48	20	15
Single Span	0	1510	150	0	160	160	10	10	24	24	10	10

*Displaced volume includes fill and excavation of soil or other material

In addition to the hydraulic parameters addressed in this report, the selection of the best solution for a creek crossing, may also consider cost, accessibility, environmental impact, and other relevant factors.

Rock armoring (riprap) was considered in the volume calculations to protect both the single-span and multi-span bridges. This armoring is recommended at the abutments and piers to protect the long term life of the structure and to ensure the bridges are available for use during and immediately following a significant rainfall event. Below are typical details of the rock armoring to be used. If larger rock (Based on Velocity) is un-available grouting would be required.

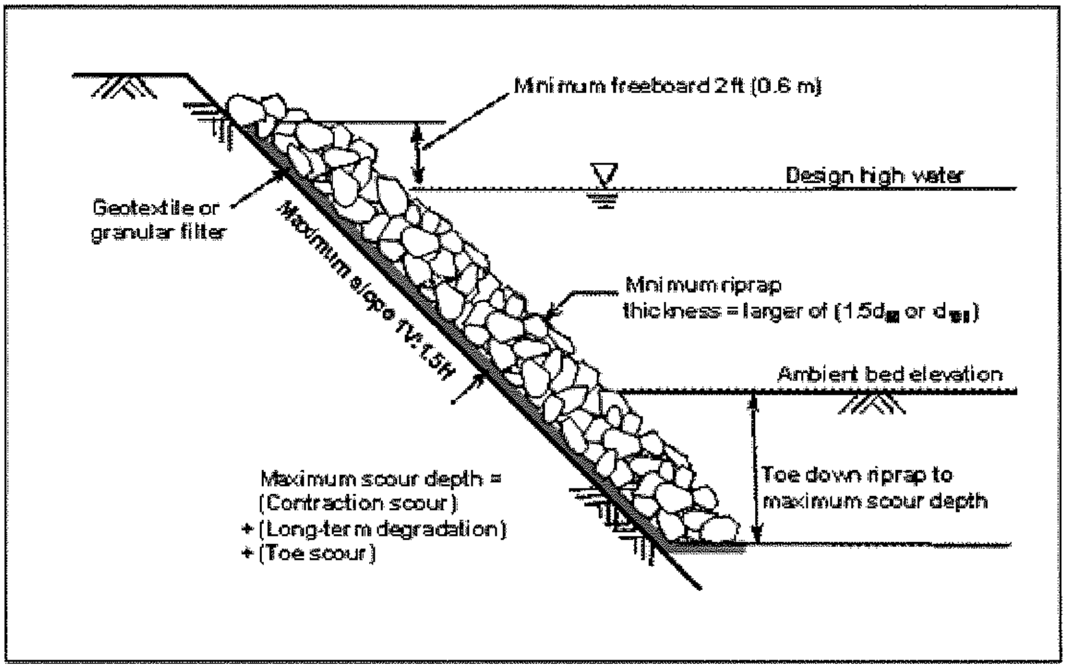


Figure 1. Riprap revetment with buried toe.

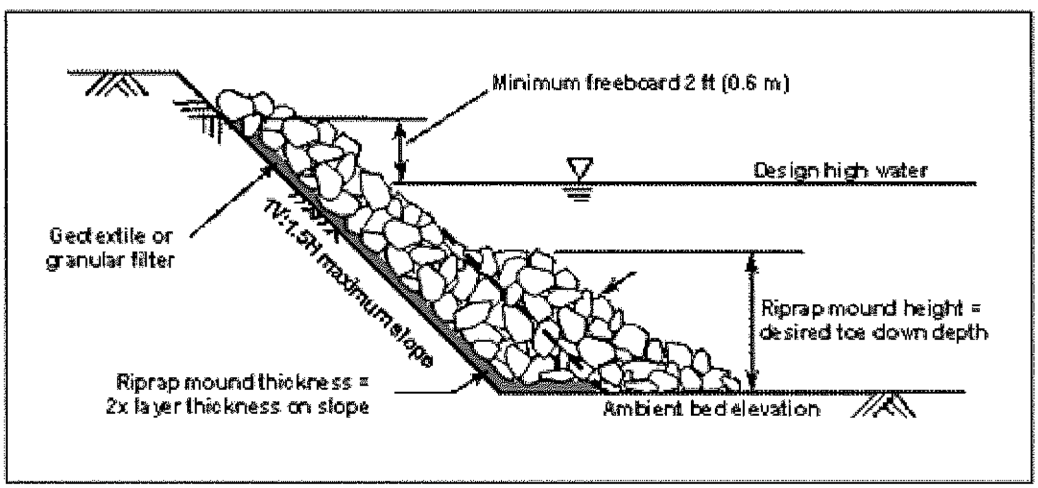


Figure 2. Riprap revetment with mounded toe.

REFERENCES

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http://streamstats.usgs.gov/california.html

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CONCEPTUAL CROSSING 4 - FORD COST ESTIMATE

PROJECT				CLIENT	
Panoche Valley Solar Farm				ENERGY RENEWAL PARTNERS	
ALTERNATIVE: Crossing 4 Ford			DATE: 2/13/2014	Prepared by: WHPACIFIC, INC	
ITEM DESCRIPTION		UNIT	AMOUNT	UNIT COST	TOTAL
	MOBILIZATION	LS	All	8.0% Biddable	$ 3,262.80
	EXCAVATION	CUYD	165.00	$ 45.00	$ 7,425.00
	3/4 INCH - 0 AGGREGATE BASE	CUYD	40.00	$ 12.00	$ 480.00
	ARTICULATING CONCRETE BLOCK MATTRESS	SQFT	2160.00	$ 15.00	$ 32,400.00
	EMBANKMENT GEOTEXTILE	SQYD	240.00	$ 2.00	$ 480.00
SUBTOTAL, BIDDABLE ITEMS					**$ 44,047.80**
	CONTINGENCIES, for all work listed			25.0%	$ 11,011.95
CONSTRUCTION COST					**$ 55,059.75**

CONCEPTUAL CROSSING 4 - CULVERT COST ESTIMATE

PROJECT				CLIENT	
Panoche Valley Solar Farm				ENERGY RENEWAL PARTNERS	
ALTERNATIVE: Crossing 4 Culvert			DATE: 2/13/2014	Prepared by: WHPACIFIC, INC	

	ITEM DESCRIPTION	UNIT	AMOUNT	UNIT COST	TOTAL
	MOBILIZATION	LS	All	8.0% Biddable	$ 11,318.40
	EMBANKMENT	CUYD	45.00	$ 25.00	$ 1,125.00
	STRUCTURE EXCAVATION	CUYD	125.00	$ 45.00	$ 5,625.00
	REINFORCEMENT	LS	All	$ 9,480.00	$ 9,480.00
	REINFORCED CONCRETE BOX CULVERT	FOOT	96.00	$ 700.00	$ 67,200.00
	WINGWALLS AND APRONS	CUYD	60.00	$ 830.00	$ 49,800.00
	W BEAM STEEL RAIL	LS	All	$ 8,250.00	$ 8,250.00
SUBTOTAL, BIDDABLE ITEMS					**$ 152,798.40**
	CONTINGENCIES, for all work listed			25.0%	$ 38,199.60
CONSTRUCTION COST					**$ 190,998.00**

CONCEPTUAL CROSSING 4 - FREE SPAN COST ESTIMATE

PROJECT				CLIENT	
Panoche Valley Solar Farm				ENERGY RENEWAL PARTNERS	
ALTERNATIVE			DATE	Prepared by:	
Crossing 4 - 275' Free Span Bridge			2/13/2014	WHPACIFIC, INC	
ITEM DESCRIPTION		UNIT	AMOUNT	UNIT COST	TOTAL
	MOBILIZATION	LS	All	8.0% Biddable	$ 114,957.60
	FURNISH PILE DRIVING EQUIPMENT	LS	All	$ 18,000.00	$ 18,000.00
	FURNISH PP 12-3/4 X 0.375 STEEL PILES	FOOT	320.00	$ 45.00	$ 14,400.00
	DRIVE PP 12-3/4 X 0.375 STEEL PILES	EACH	8.00	$ 650.00	$ 5,200.00
	GENERAL STRUCTURAL CONCRETE, CLASS 3300	LS	All	$ 17,850.00	$ 17,850.00
	REINFORCEMENT	LS	All	$ 5,520.00	$ 5,520.00
	PREFABRICATED STEEL TRUSS	FOOT	275.00	$ 4,800.00	$ 1,320,000.00
	FURNISH CRANE FOR LIFTING TRUSS	LS	All	$ 50,000.00	$ 50,000.00
	ASHPALT PAVING	TON	60.00	$ 100.00	$ 6,000.00
SUBTOTAL, BIDDABLE ITEMS					**$ 1,551,927.60**
	CONTINGENCIES, for all work listed			25.0%	$ 387,981.90
CONSTRUCTION COST					**$ 1,939,909.50**

CONCEPTUAL CROSSING 4 - MULTI-SPAN BRIDGE COST ESTIMATE

PROJECT			CLIENT	
Panoche Valley Solar Farm			ENERGY RENEWAL PARTNERS	
ALTERNATIVE		DATE	Prepared by:	
Crossing 4 - 2 Span 56' Bridge		2/13/2014	WHPACIFIC, INC	

ITEM DESCRIPTION	UNIT	AMOUNT	UNIT COST	TOTAL
MOBILIZATION	LS	All	8.0% Biddable	$ 9,560.40
STRUCTURE EXCAVATION	CUYD	75.00	$ 45.00	$ 3,375.00
FURNISH PILE DRIVING EQUIPMENT	LS	All	$ 18,000.00	$ 18,000.00
FURNISH PP 12-3/4 X 0.375 STEEL PILES	FOOT	360.00	$ 45.00	$ 16,200.00
DRIVE PP 12-3/4 X 0.375 STEEL PILES	EACH	9.00	$ 650.00	$ 5,850.00
GENERAL STRUCTURAL CONCRETE, CLASS 3300	LS	All	$ 21,000.00	$ 21,000.00
REINFORCEMENT	LS	All	$ 6,360.00	$ 6,360.00
15 INCH PRECAST PRESTRESSED SLABS	FOOT	224.00	$ 180.00	$ 40,320.00
W BEAM STEEL RAIL	LS	All	$ 8,400.00	$ 8,400.00
SUBTOTAL, BIDDABLE ITEMS				**$ 129,065.40**
CONTINGENCIES, for all work listed			25.0%	$ 32,266.35
CONSTRUCTION COST				**$ 161,331.75**

CONCEPTUAL CROSSING 4 - SINGLE SPAN BRIDGE COST ESTIMATE

PROJECT			CLIENT
Panoche Valley Solar Farm			ENERGY RENEWAL PARTNERS
ALTERNATIVE		DATE	Prepared by:
Crossing 4 - Single Span 56' Bridge		2/13/2014	WHPACIFIC, INC

	ITEM DESCRIPTION	UNIT	AMOUNT	UNIT COST	TOTAL
	MOBILIZATION	LS	All	8.0% Biddable	$ 9,174.00
	STRUCTURE EXCAVATION	CUYD	65.00	$ 45.00	$ 2,925.00
	FURNISH PILE DRIVING EQUIPMENT	LS	All	$ 18,000.00	$ 18,000.00
	FURNISH PP 12-3/4 X 0.375 STEEL PILES	FOOT	300.00	$ 45.00	$ 13,500.00
	DRIVE PP 12-3/4 X 0.375 STEEL PILES	EACH	10.00	$ 650.00	$ 6,500.00
	GENERAL STRUCTURAL CONCRETE, CLASS 3300	LS	All	$ 15,750.00	$ 15,750.00
	REINFORCEMENT	LS	All	$ 4,800.00	$ 4,800.00
	26 INCH PRECAST PRESTRESSED SLABS	FOOT	224.00	$ 200.00	$ 44,800.00
	W BEAM STEEL RAIL	LS	All	$ 8,400.00	$ 8,400.00
SUBTOTAL, BIDDABLE ITEMS					**$ 123,849.00**
	CONTINGENCIES, for all work listed			25.0%	$ 30,962.25
CONSTRUCTION COST					**$ 154,811.25**

CONCEPTUAL CROSSING 5 - FORD COST ESTIMATE

PROJECT				CLIENT	
Panoche Valley Solar Farm				ENERGY RENEWAL PARTNERS	
ALTERNATIVE: Crossing 5 Ford			DATE: 2/13/2014	Prepared by: WHPACIFIC, INC	
ITEM DESCRIPTION		UNIT	AMOUNT	UNIT COST	TOTAL
	MOBILIZATION	LS	All	8.0% Biddable	$ 4,736.80
	EXCAVATION	CUYD	320.00	$ 45.00	$ 14,400.00
	3/4 INCH - 0 AGGREGATE BASE	CUYD	55.00	$ 12.00	$ 660.00
	ARTICULATING CONCRETE BLOCK MATTRESS	SQFT	2900.00	$ 15.00	$ 43,500.00
	EMBANKMENT GEOTEXTILE	SQYD	325.00	$ 2.00	$ 650.00
SUBTOTAL, BIDDABLE ITEMS					**$ 63,946.80**
	CONTINGENCIES, for all work listed			25.0%	$ 15,986.70
CONSTRUCTION COST					**$ 79,933.50**

CONCEPTUAL CROSSING 5 - CULVERT COST ESTIMATE

PROJECT			CLIENT	
Panoche Valley Solar Farm			ENERGY RENEWAL PARTNERS	
ALTERNATIVE		DATE	Prepared by:	
Crossing 5 Culvert		2/13/2014	WHPACIFIC, INC	

ITEM DESCRIPTION	UNIT	AMOUNT	UNIT COST	TOTAL
MOBILIZATION	LS	All	8.0% Biddable	$ 11,441.20
EMBANKMENT	CUYD	5.00	$ 25.00	$ 125.00
STRUCTURE EXCAVATION	CUYD	50.00	$ 45.00	$ 2,250.00
REINFORCEMENT	LS	All	$ 10,440.00	$ 10,440.00
REINFORCED CONCRETE BOX CULVERT	FOOT	80.00	$ 850.00	$ 68,000.00
WINGWALLS AND APRONS	CUYD	65.00	$ 830.00	$ 53,950.00
W BEAM STEEL RAIL	LS	All	$ 8,250.00	$ 8,250.00
SUBTOTAL, BIDDABLE ITEMS				**$ 154,456.20**
CONTINGENCIES, for all work listed			25.0%	$ 38,614.05
CONSTRUCTION COST				**$ 193,070.25**

CONCEPTUAL CROSSING 5 - FREE SPAN COST ESTIMATE

PROJECT					CLIENT
Panoche Valley Solar Farm					ENERGY RENEWAL PARTNERS
ALTERNATIVE: Crossing 5 - 275' Free Span Bridge			DATE: 2/13/2014		Prepared by: WHPACIFIC, INC
	ITEM DESCRIPTION	UNIT	AMOUNT	UNIT COST	TOTAL
	MOBILIZATION	LS	All	8.0% Biddable	$ 114,957.60
	FURNISH PILE DRIVING EQUIPMENT	LS	All	$ 18,000.00	$ 18,000.00
	FURNISH PP 12-3/4 X 0.375 STEEL PILES	FOOT	320.00	$ 45.00	$ 14,400.00
	DRIVE PP 12-3/4 X 0.375 STEEL PILES	EACH	8.00	$ 650.00	$ 5,200.00
	GENERAL STRUCTURAL CONCRETE, CLASS 3300	LS	All	$ 17,850.00	$ 17,850.00
	REINFORCEMENT	LS	All	$ 5,520.00	$ 5,520.00
	PREFABRICATED STEEL TRUSS	FOOT	275.00	$ 4,800.00	$ 1,320,000.00
	FURNISH CRANE FOR LIFTING TRUSS	LS	All	$ 50,000.00	$ 50,000.00
	ASHPALT PAVING	TON	60.00	$ 100.00	$ 6,000.00
SUBTOTAL, BIDDABLE ITEMS					**$ 1,551,927.60**
	CONTINGENCIES, for all work listed			25.0%	$ 387,981.90
CONSTRUCTION COST					**$ 1,939,909.50**

CONCEPTUAL CROSSING 5 - MULTI-SPAN BRIDGE COST ESTIMATE

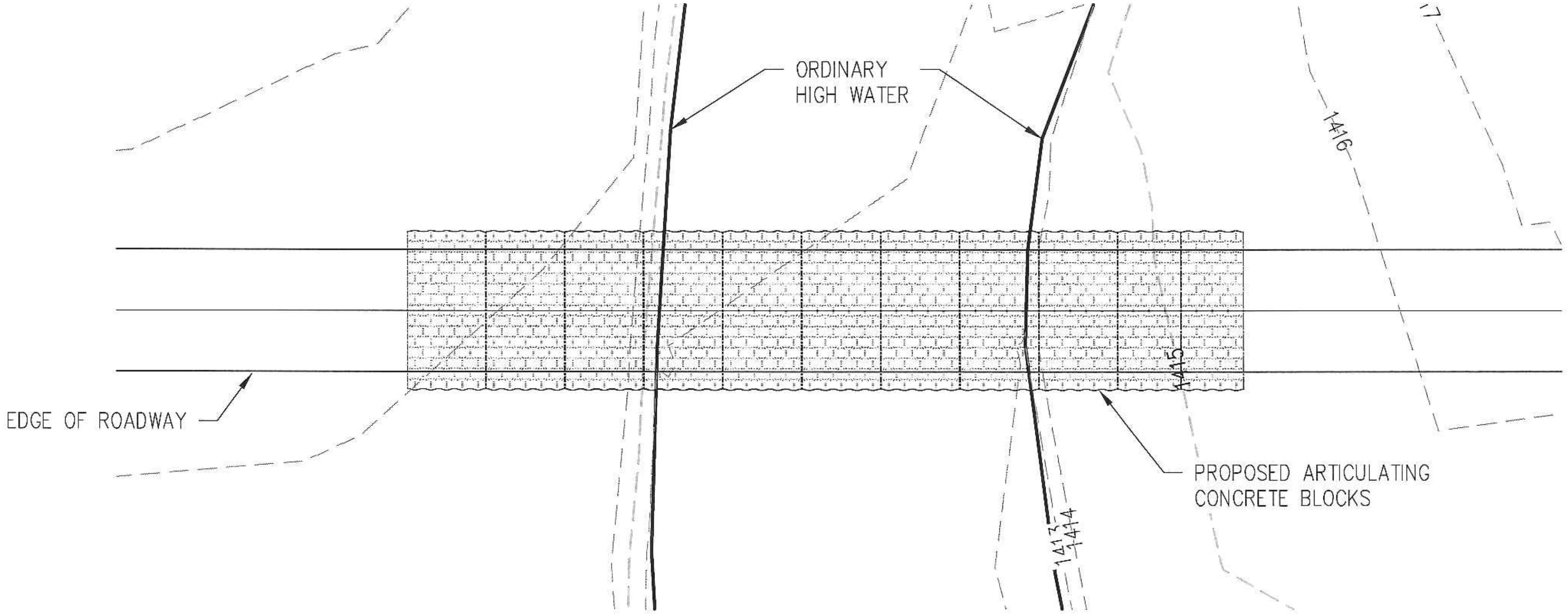
PROJECT		CLIENT
Panoche Valley Solar Farm		ENERGY RENEWAL PARTNERS
ALTERNATIVE	DATE	Prepared by:
Crossing 5 - 2 Span 54' Bridge	2/13/2014	WHPACIFIC, INC

	ITEM DESCRIPTION	UNIT	AMOUNT	UNIT COST	TOTAL
	MOBILIZATION	LS	All	8.0% Biddable	$ 9,385.20
	STRUCTURE EXCAVATION	CUYD	65.00	$ 45.00	$ 2,925.00
	FURNISH PILE DRIVING EQUIPMENT	LS	All	$ 18,000.00	$ 18,000.00
	FURNISH PP 12-3/4 X 0.375 STEEL PILES	FOOT	360.00	$ 45.00	$ 16,200.00
	DRIVE PP 12-3/4 X 0.375 STEEL PILES	EACH	9.00	$ 650.00	$ 5,850.00
	GENERAL STRUCTURAL CONCRETE, CLASS 3300	LS	All	$ 21,000.00	$ 21,000.00
	REINFORCEMENT	LS	All	$ 6,360.00	$ 6,360.00
	15 INCH PRECAST PRESTRESSED SLABS	FOOT	216.00	$ 180.00	$ 38,880.00
	W BEAM STEEL RAIL	LS	All	$ 8,100.00	$ 8,100.00
SUBTOTAL, BIDDABLE ITEMS					**$ 126,700.20**
	CONTINGENCIES, for all work listed			25.0%	$ 31,675.05
CONSTRUCTION COST					**$ 158,375.25**

CONCEPTUAL CROSSING 5 - SINGLE SPAN BRIDGE COST ESTIMATE

PROJECT				CLIENT	
Panoche Valley Solar Farm				ENERGY RENEWAL PARTNERS	
ALTERNATIVE: Crossing 5 - Single Span 54' Bridge			DATE: 2/13/2014	Prepared by: WHPACIFIC, INC	

	ITEM DESCRIPTION	UNIT	AMOUNT	UNIT COST	TOTAL
	MOBILIZATION	LS	All	8.0% Biddable	$ 9,022.00
	STRUCTURE EXCAVATION	CUYD	65.00	$ 45.00	$ 2,925.00
	FURNISH PILE DRIVING EQUIPMENT	LS	All	$ 18,000.00	$ 18,000.00
	FURNISH PP 12-3/4 X 0.375 STEEL PILES	FOOT	300.00	$ 45.00	$ 13,500.00
	DRIVE PP 12-3/4 X 0.375 STEEL PILES	EACH	10.00	$ 650.00	$ 6,500.00
	GENERAL STRUCTURAL CONCRETE, CLASS 3300	LS	All	$ 15,750.00	$ 15,750.00
	REINFORCEMENT	LS	All	$ 4,800.00	$ 4,800.00
	26 INCH PRECAST PRESTRESSED SLABS	FOOT	216.00	$ 200.00	$ 43,200.00
	W BEAM STEEL RAIL	LS	All	$ 8,100.00	$ 8,100.00
SUBTOTAL, BIDDABLE ITEMS					**$ 121,797.00**
	CONTINGENCIES, for all work listed			25.0%	$ 30,449.25
CONSTRUCTION COST					**$ 152,246.25**



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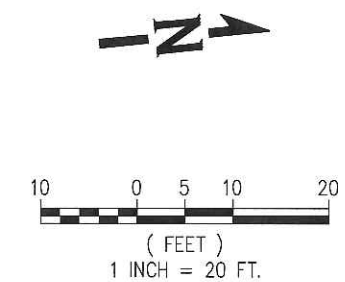

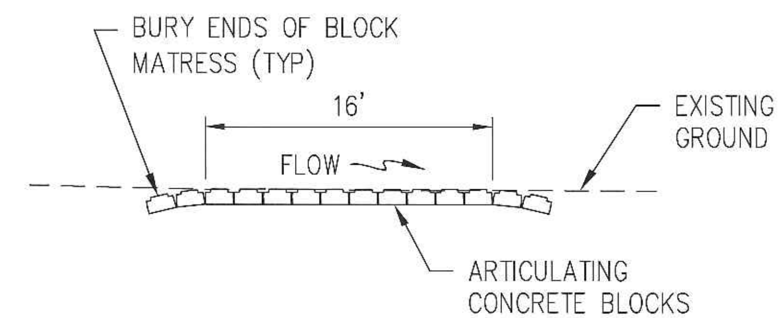

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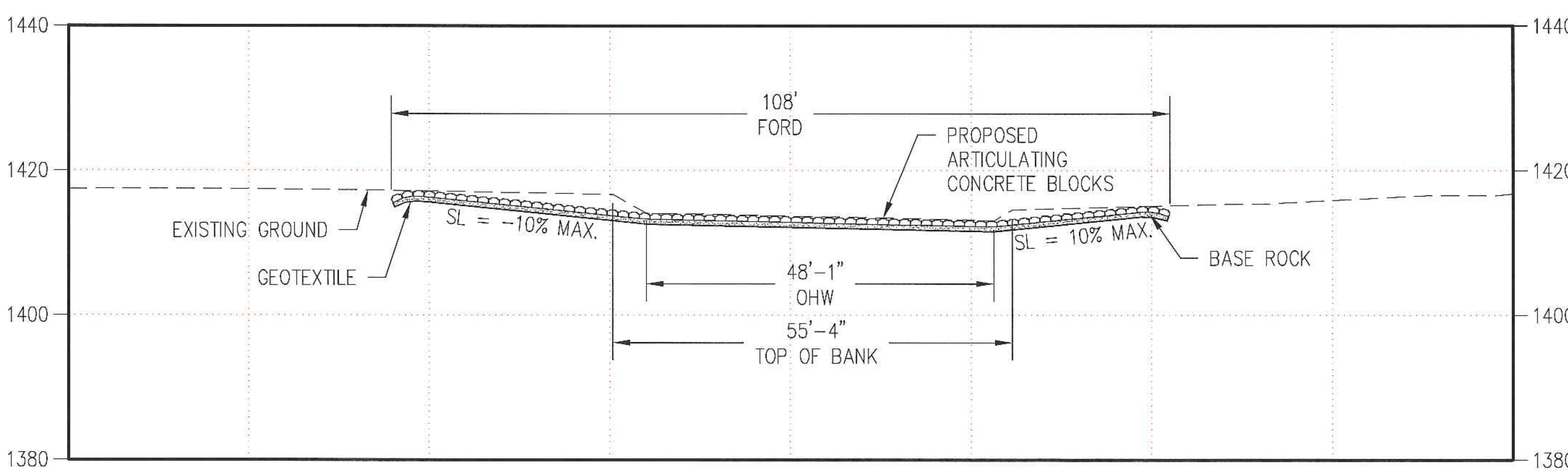

ELEVATION

CROSSING 4 - FORD

PANOCHE VALLEY SOLAR FARM
PLAN, ELEVATION AND TYPICAL SECTION

WHPacific

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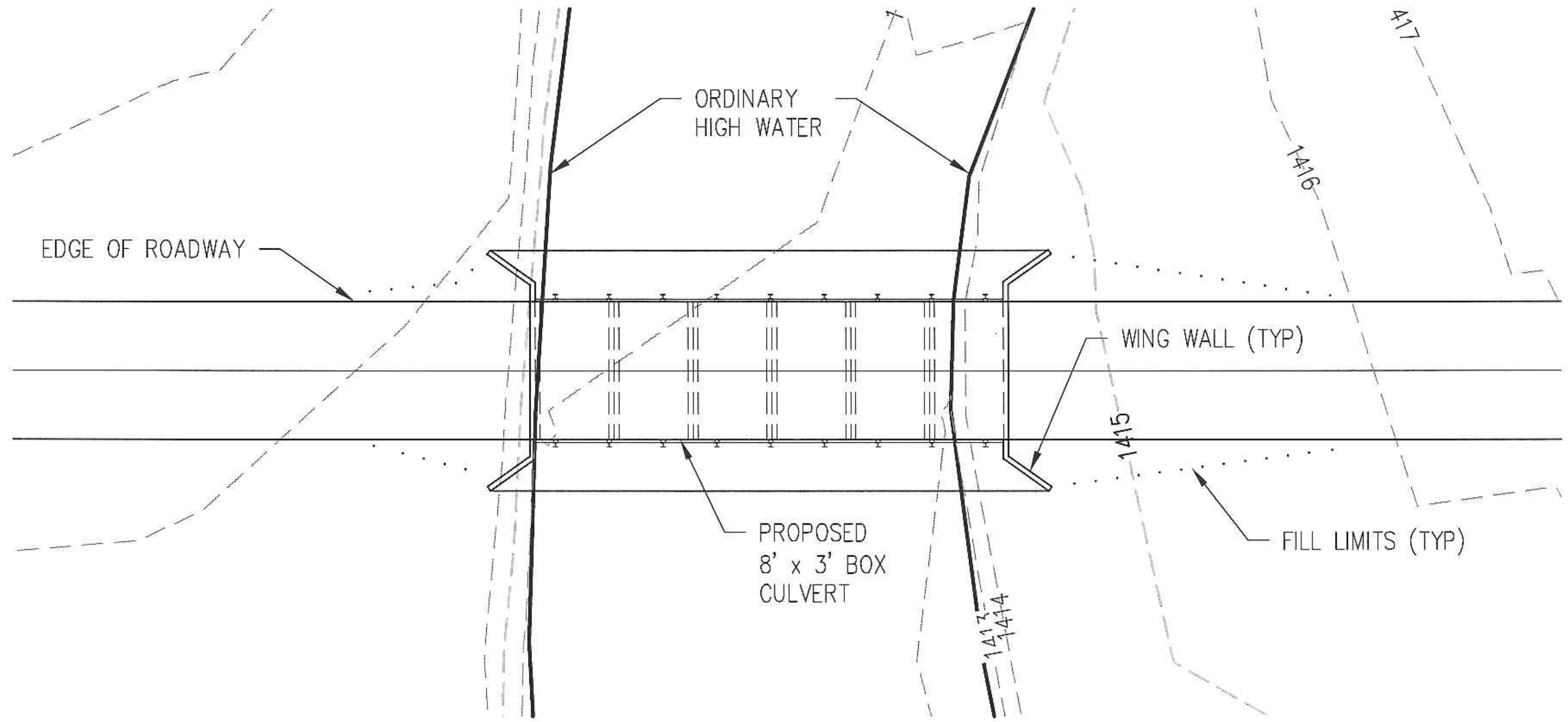

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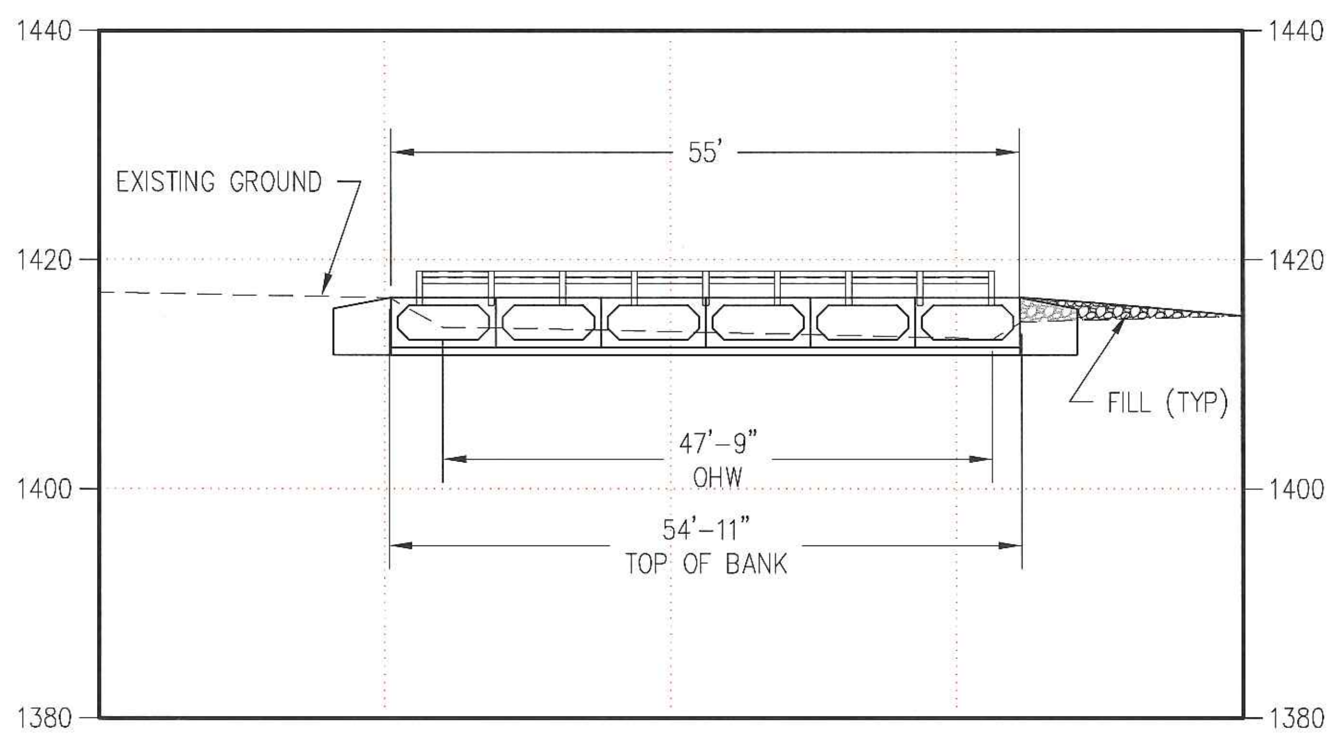

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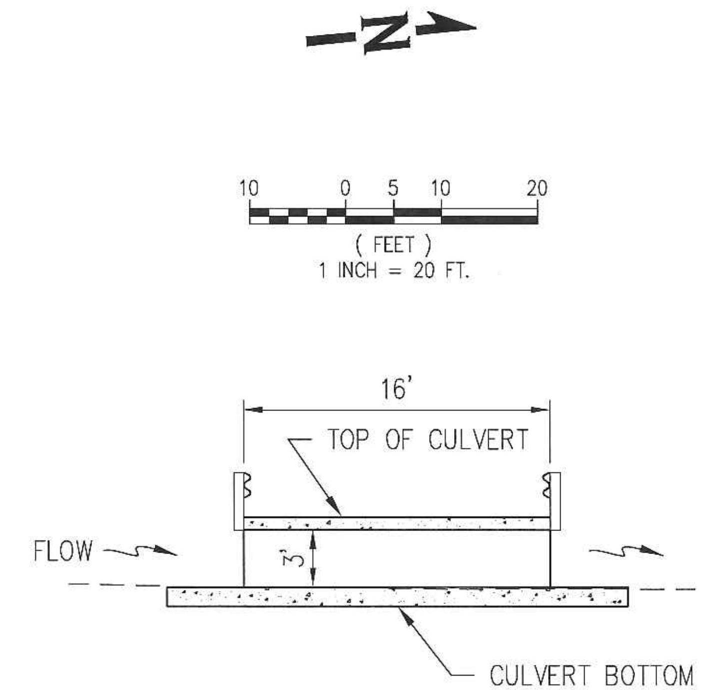

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PANOCHE VALLEY SOLAR FARM
PLAN, ELEVATION AND TYPICAL SECTION

WHPacific

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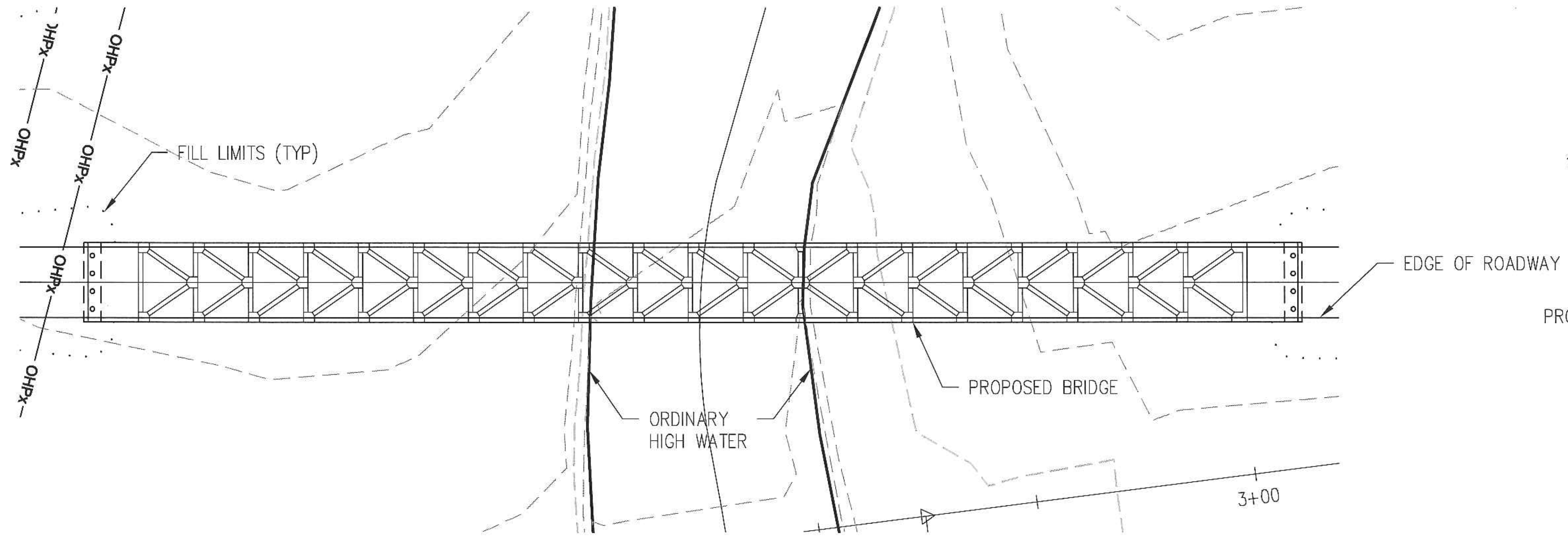

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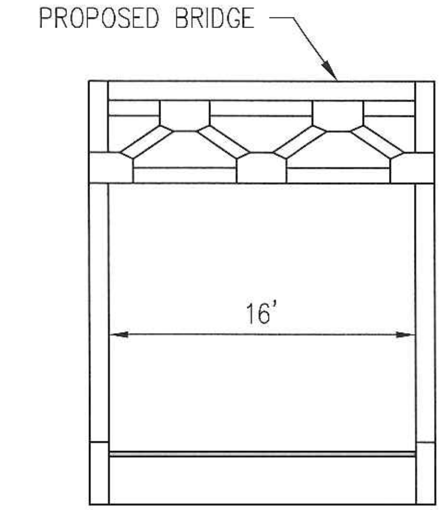

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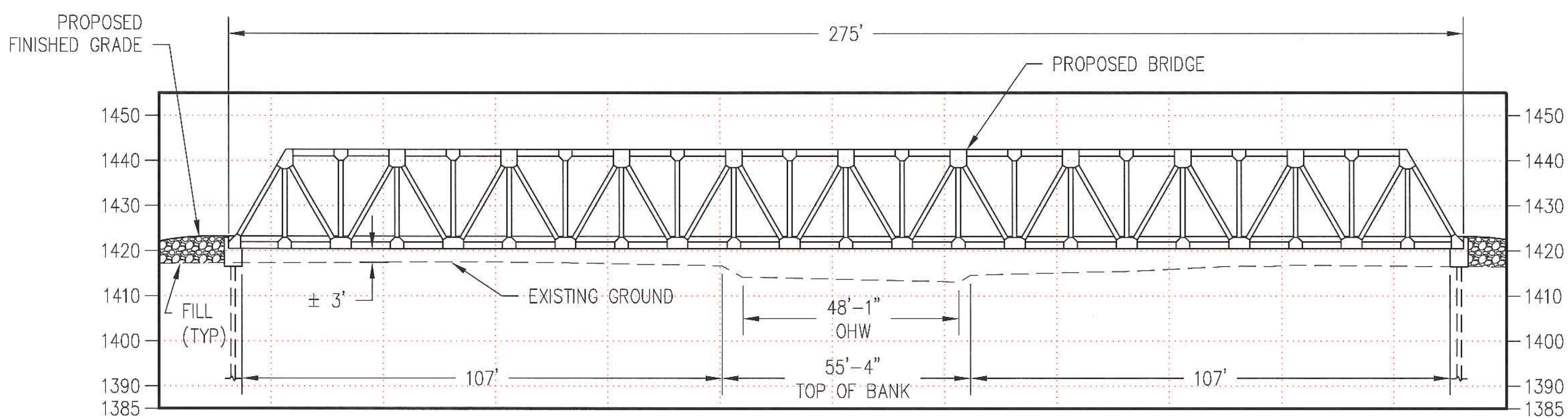

ELEVATION

CROSSING 4 - FREE SPAN

PANOCHE VALLEY SOLAR FARM
PLAN, ELEVATION AND TYPICAL SECTION

WHPacific

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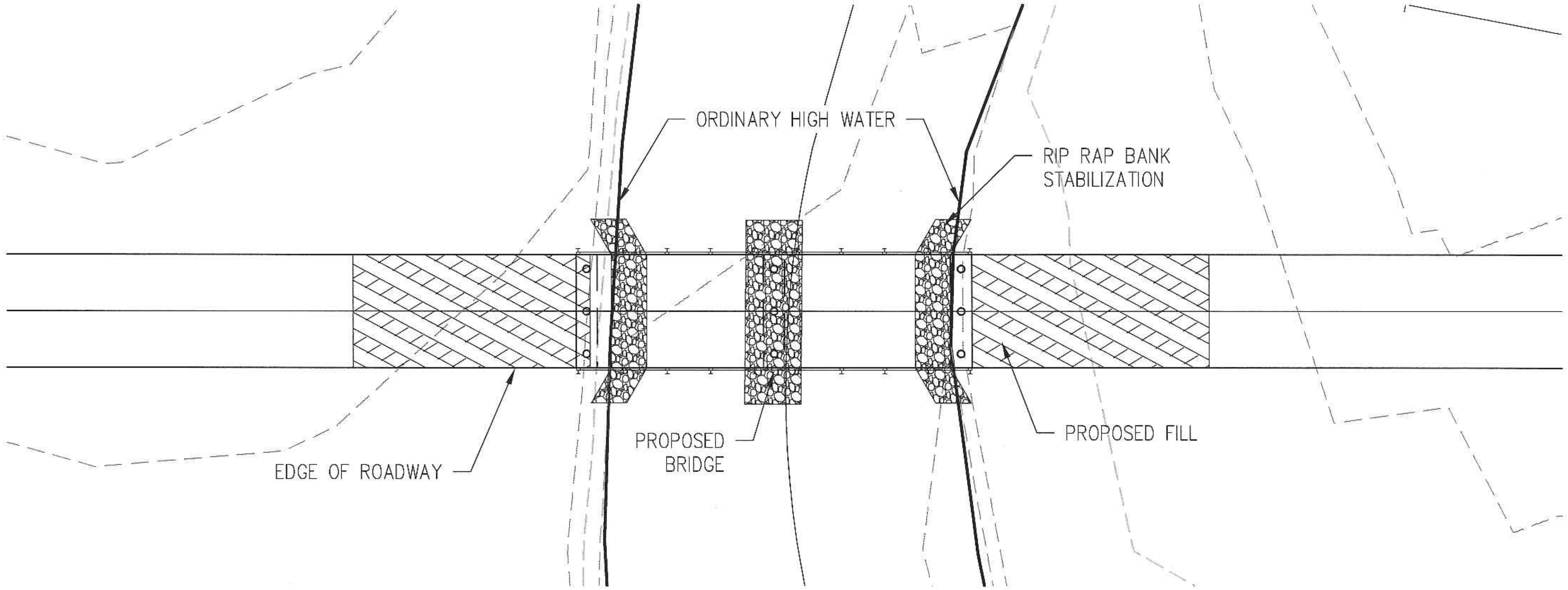

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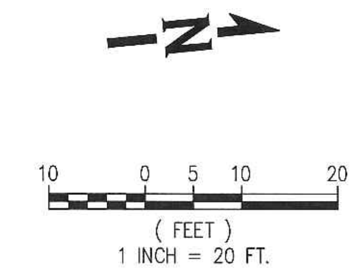

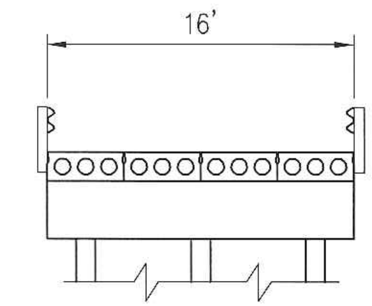

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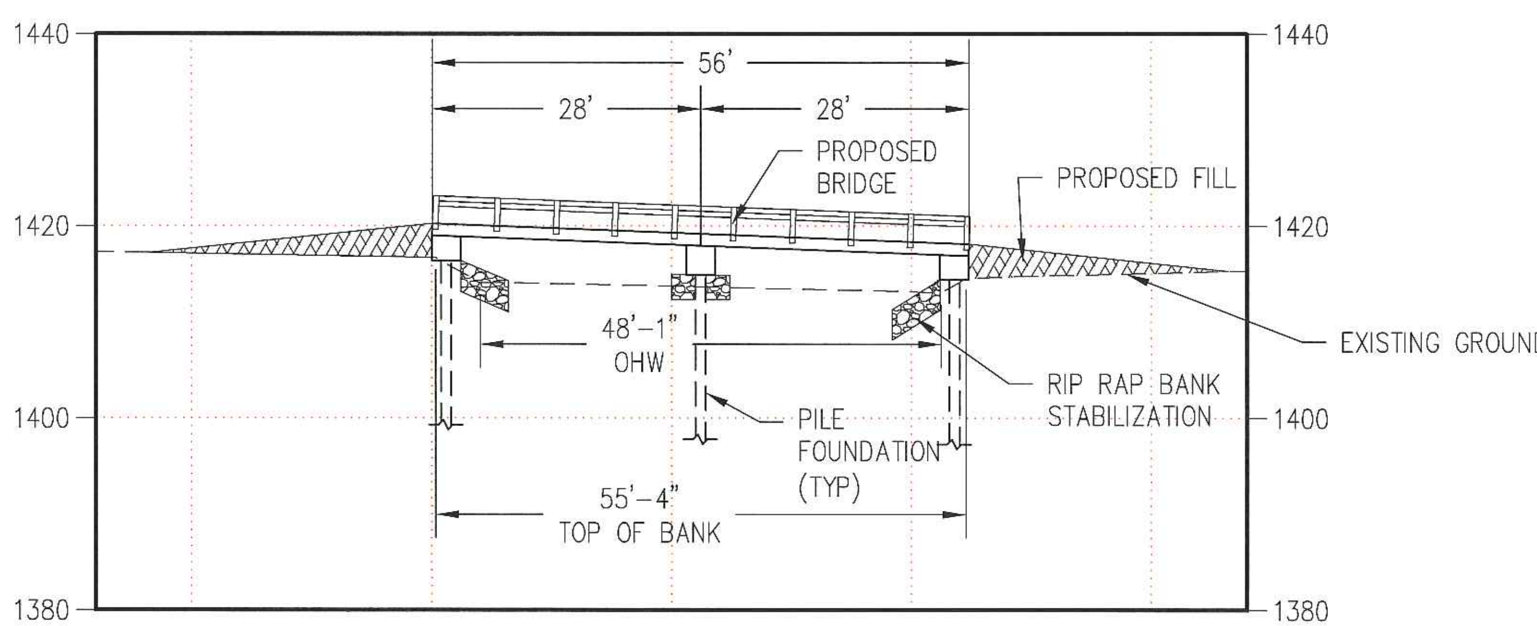

ELEVATION

CROSSING 4 - MULTI SPAN

PANOCHE VALLEY SOLAR FARM
PLAN, ELEVATION AND TYPICAL SECTION

WHPacific

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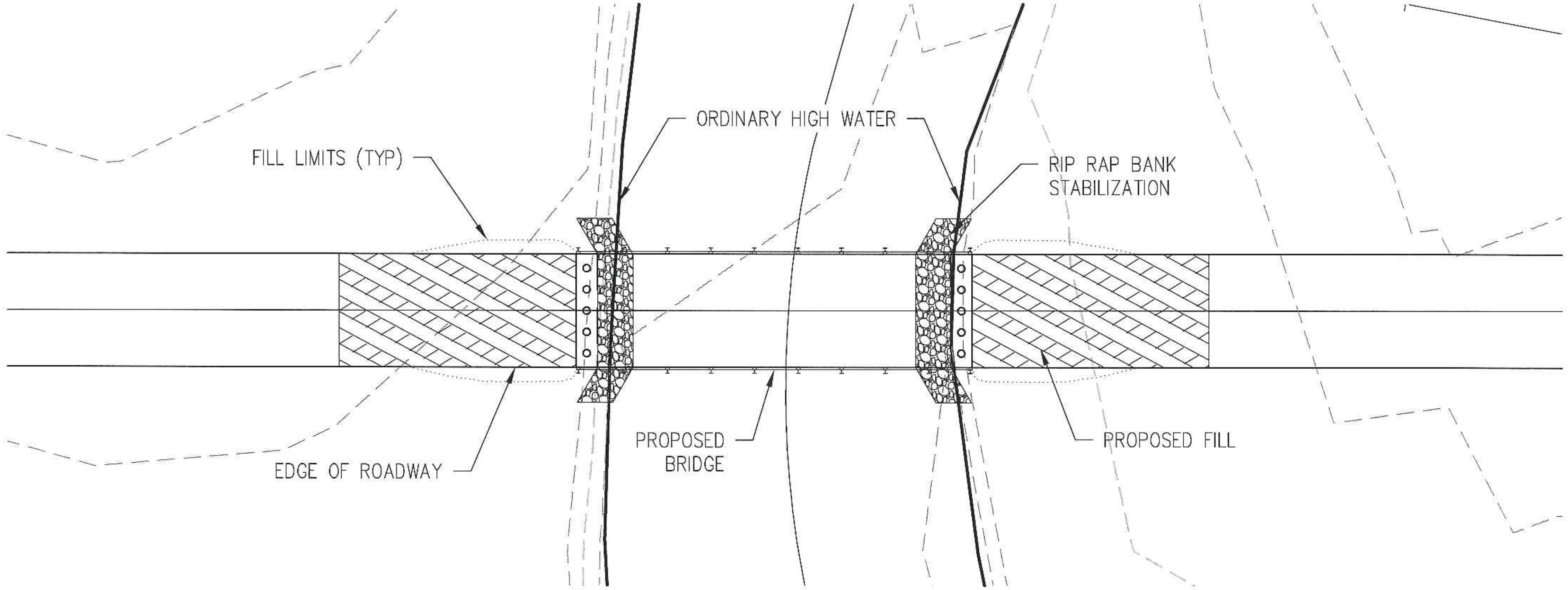

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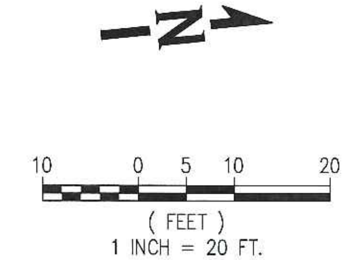

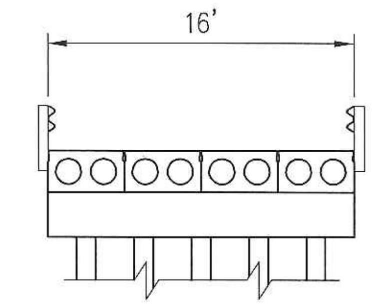

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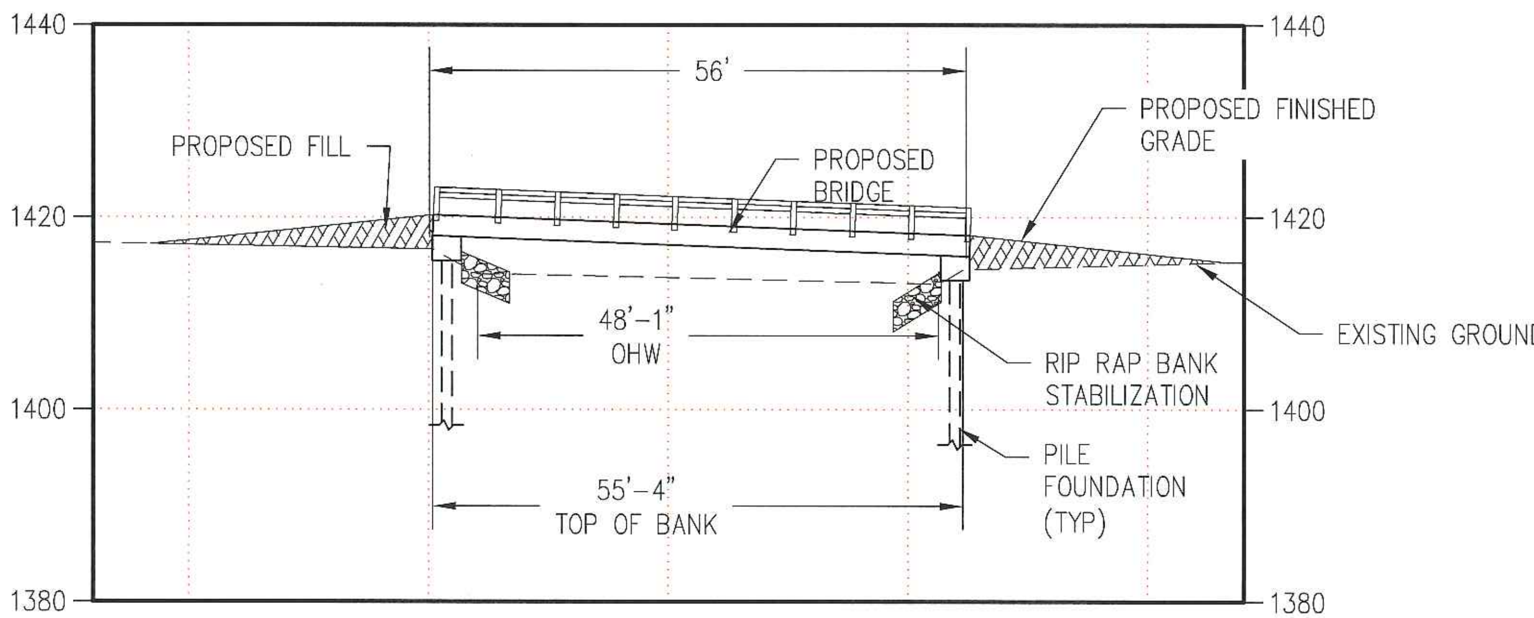

ELEVATION

CROSSING 4 - SINGLE SPAN

PANOCHE VALLEY SOLAR FARM
PLAN, ELEVATION AND TYPICAL SECTION

WHPacific

PROJECT NUMBER	DRAWING FILE NAME	DATE
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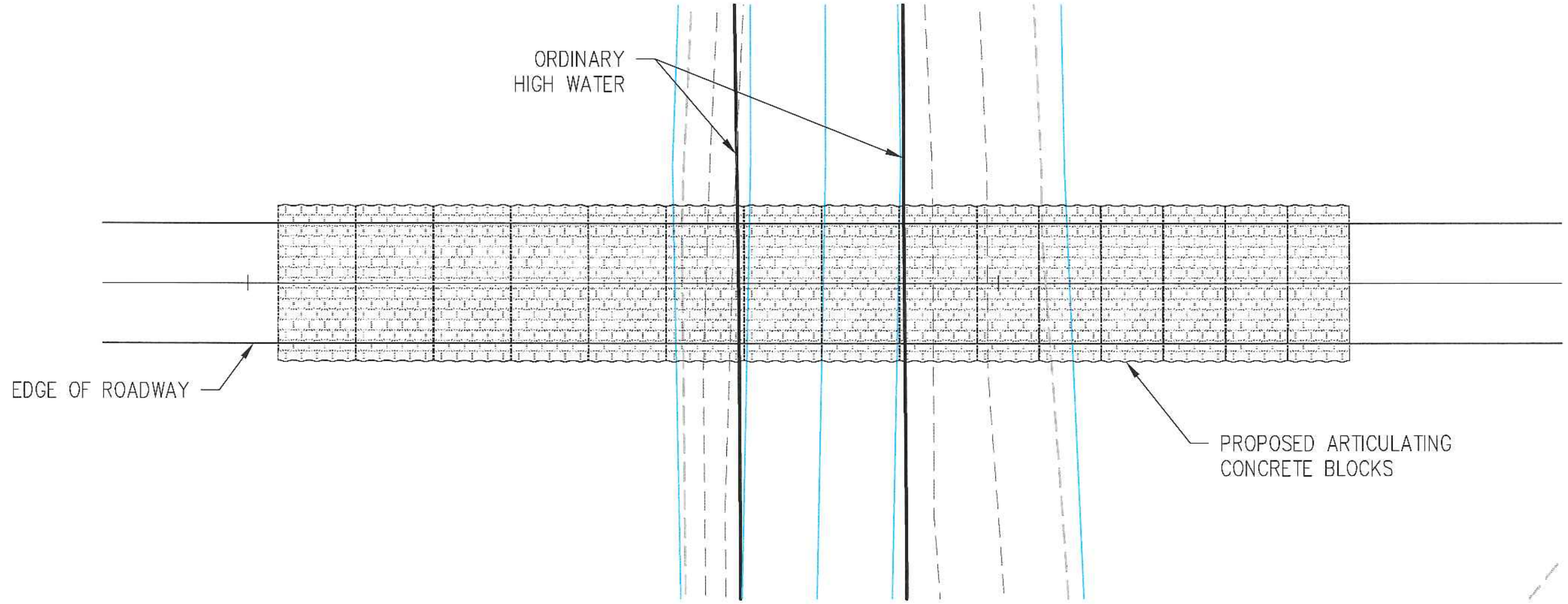

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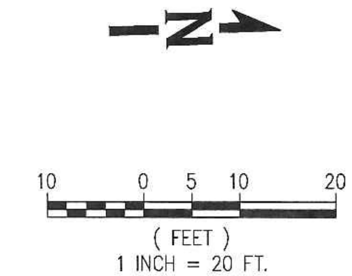

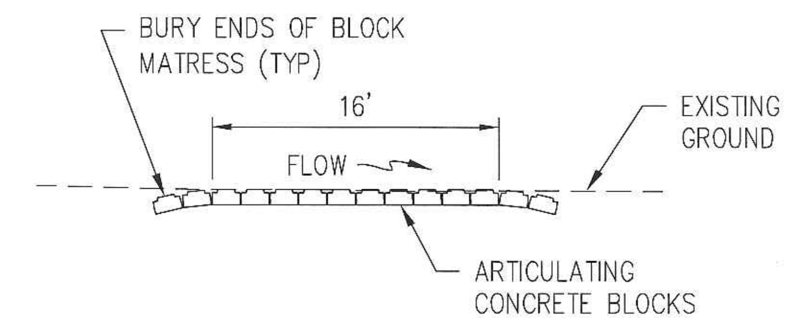

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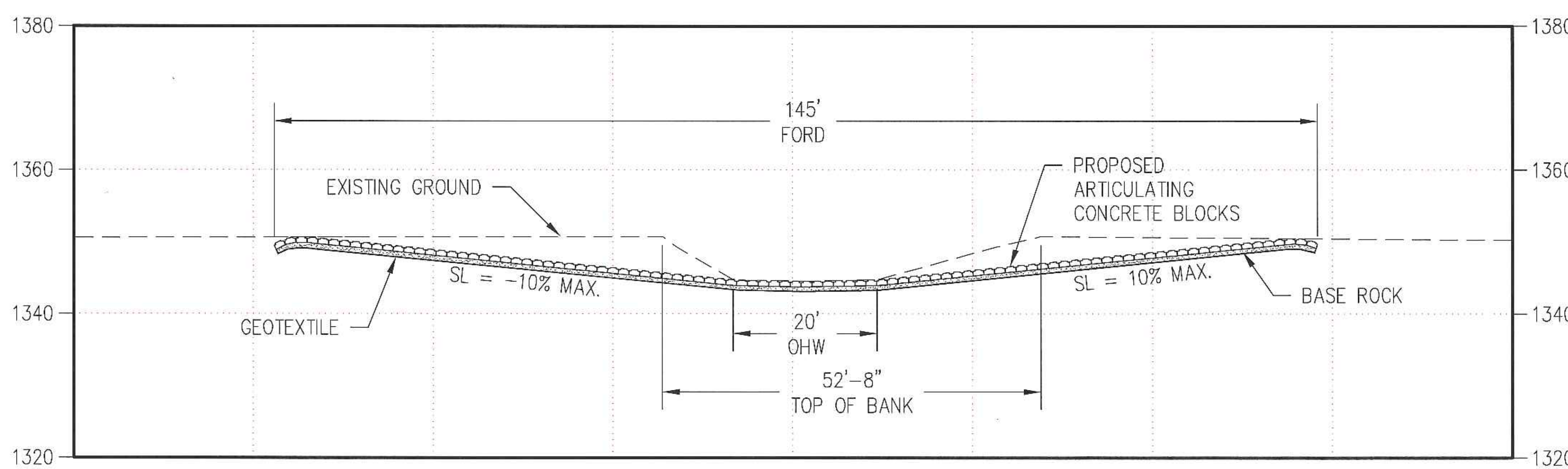

ELEVATION

CROSSING 5 - FORD

PANOCHE VALLEY SOLAR FARM
PLAN, ELEVATION AND TYPICAL SECTION

WHPacific

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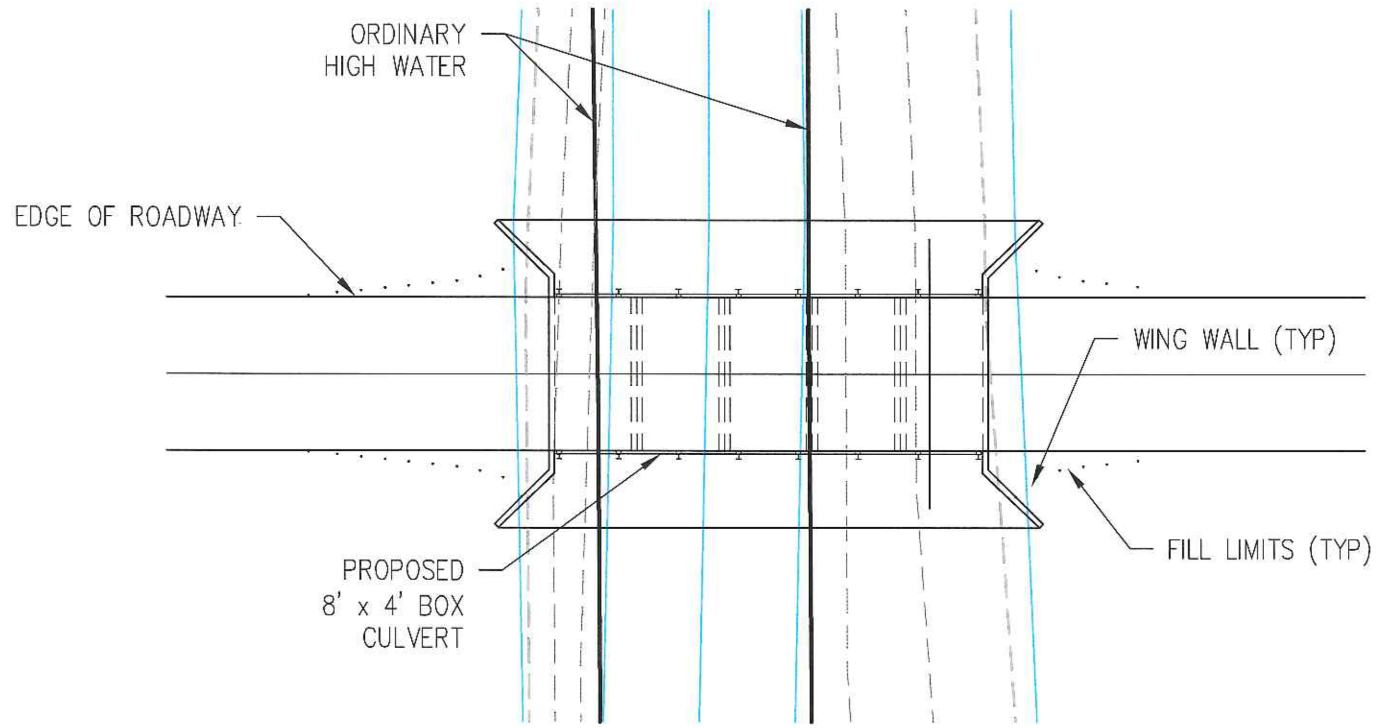

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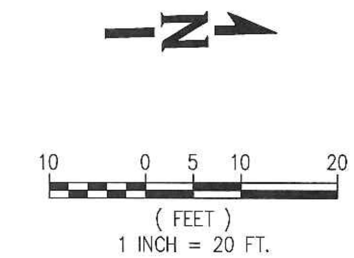

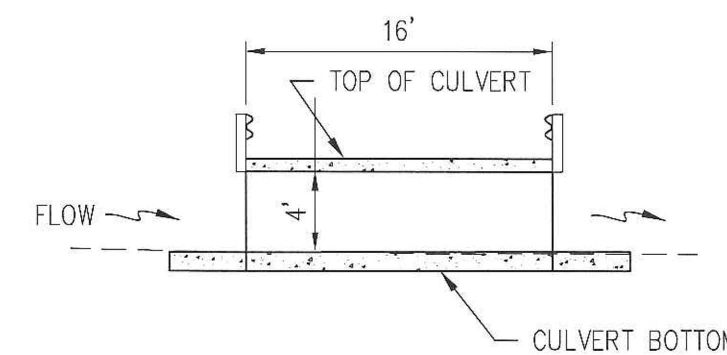

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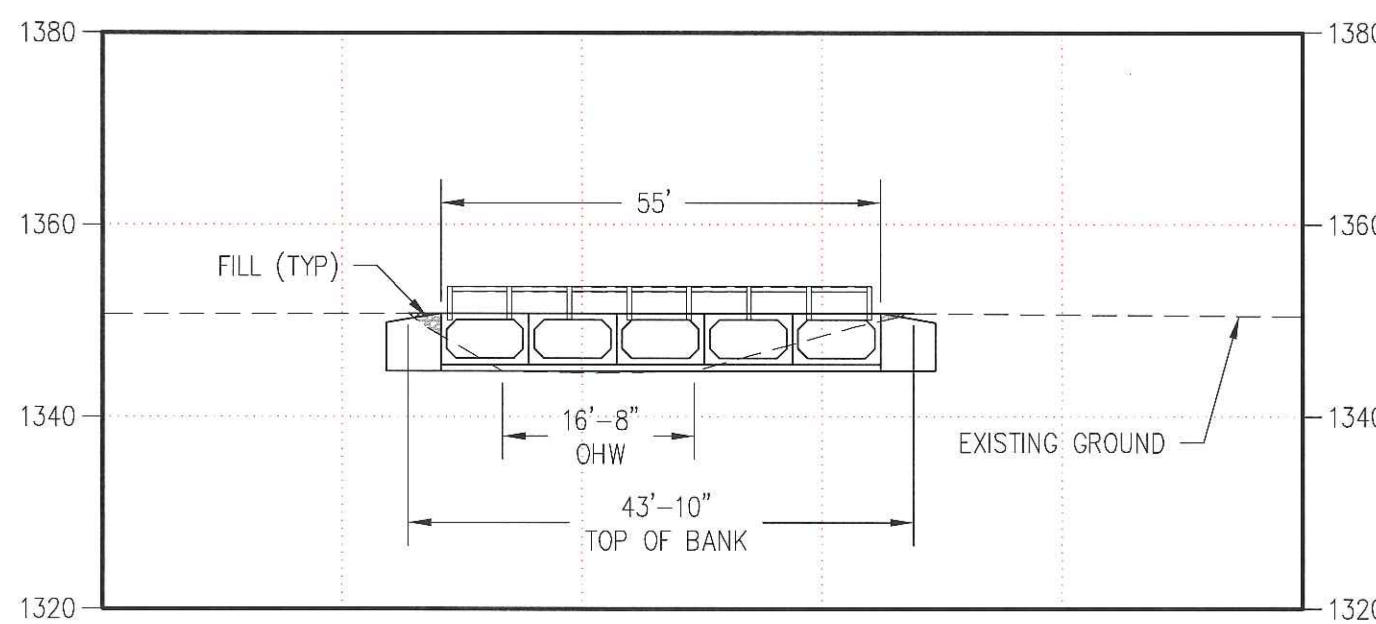

ELEVATION

CROSSING 5 - CULVERT

PANOCHE VALLEY SOLAR FARM
PLAN, ELEVATION AND TYPICAL SECTION

WHPacific

PROJECT NUMBER	DRAWING FILE NAME	DATE
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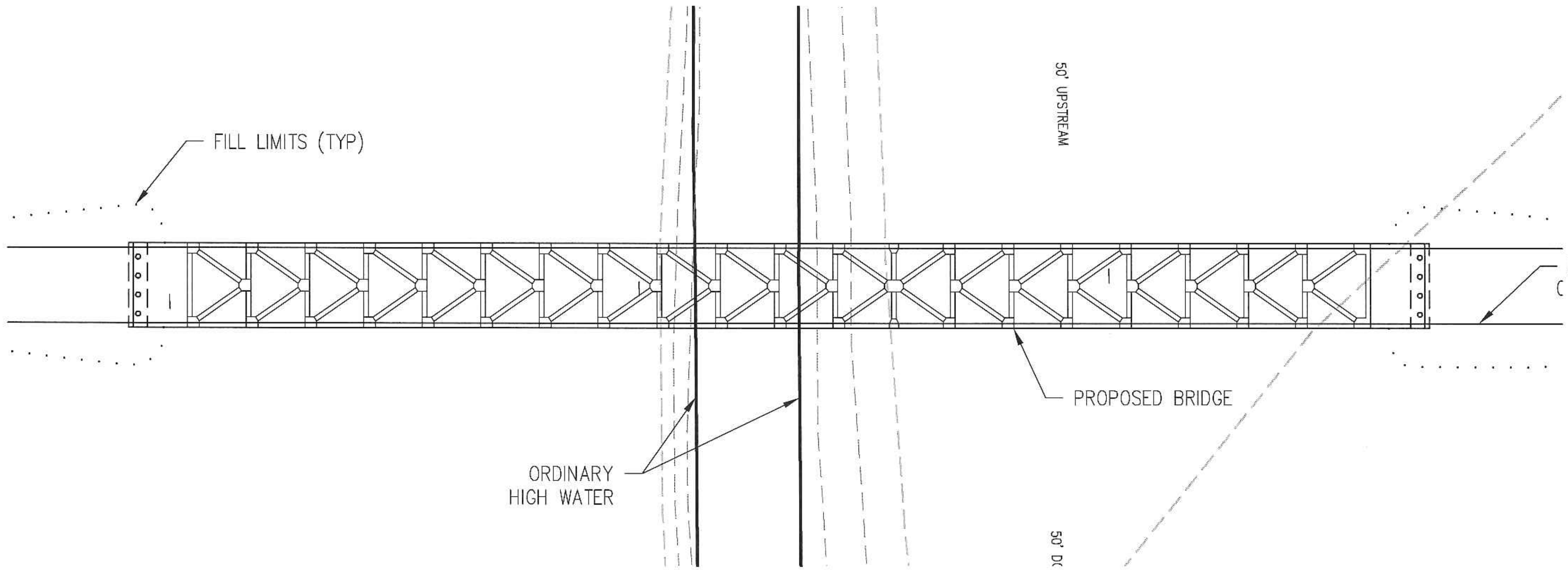
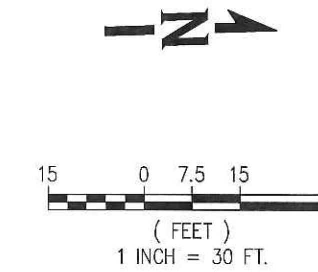
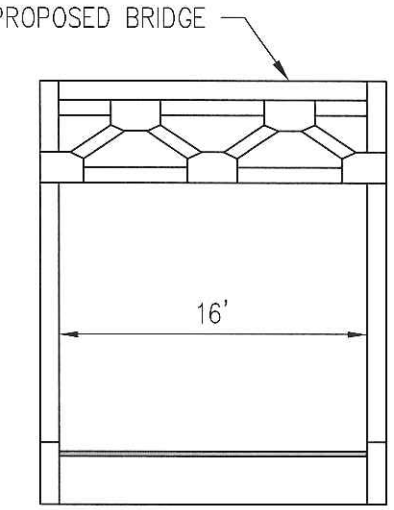


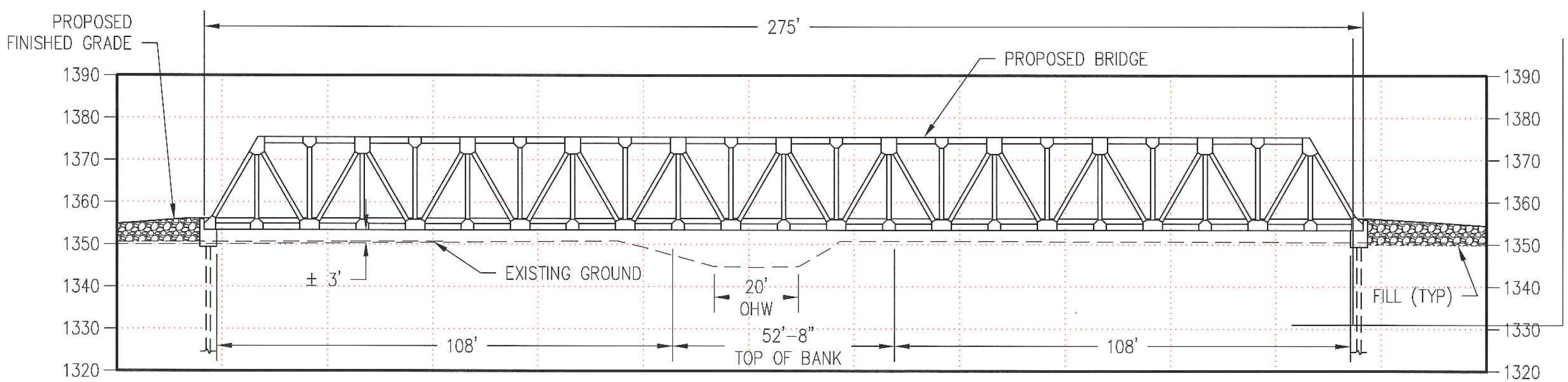
PLAN





TYPICAL SECTION

NOT TO SCALE



ELEVATION

CROSSING 5 - FREE SPAN

PANOCHE VALLEY SOLAR FARM
PLAN, ELEVATION AND TYPICAL SECTION

WHPacific

PROJECT NUMBER	DRAWING FILE NAME	DATE
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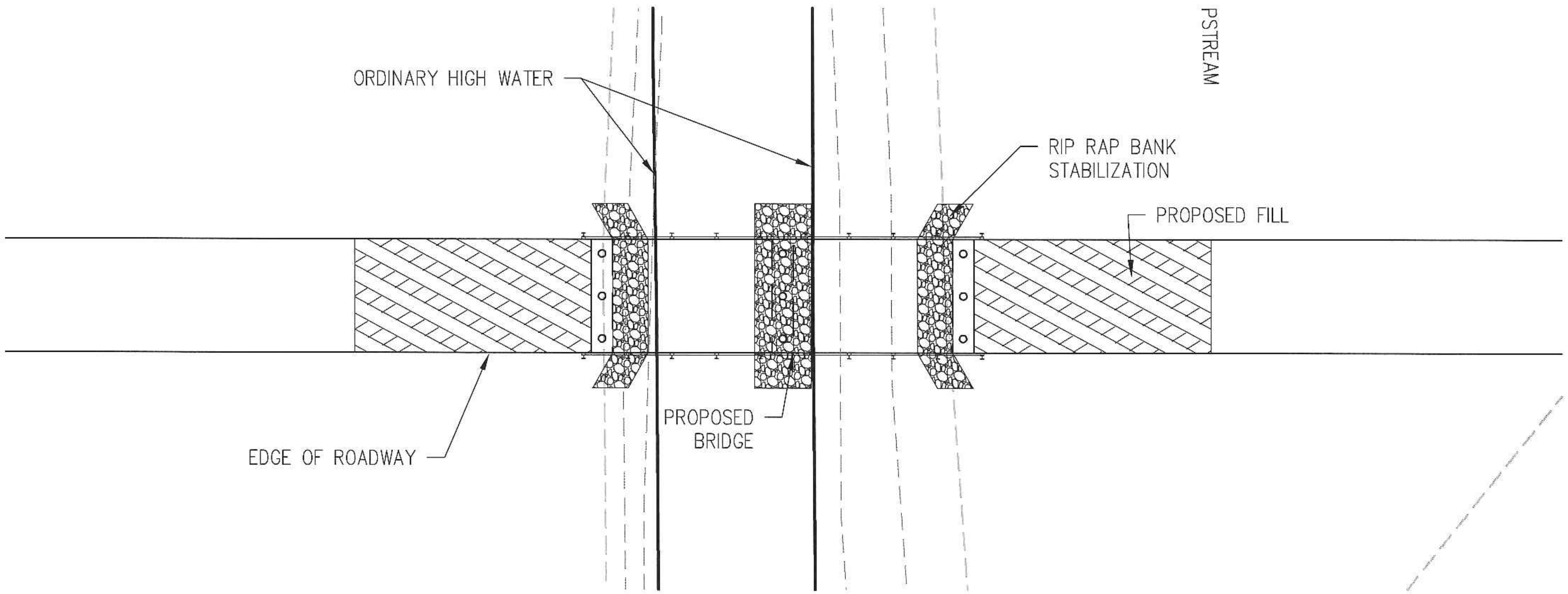
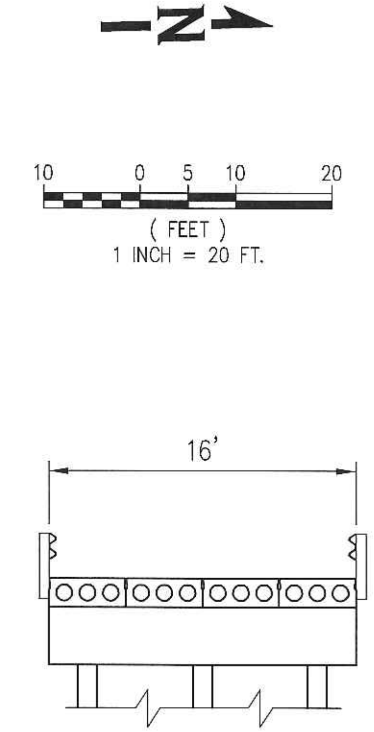
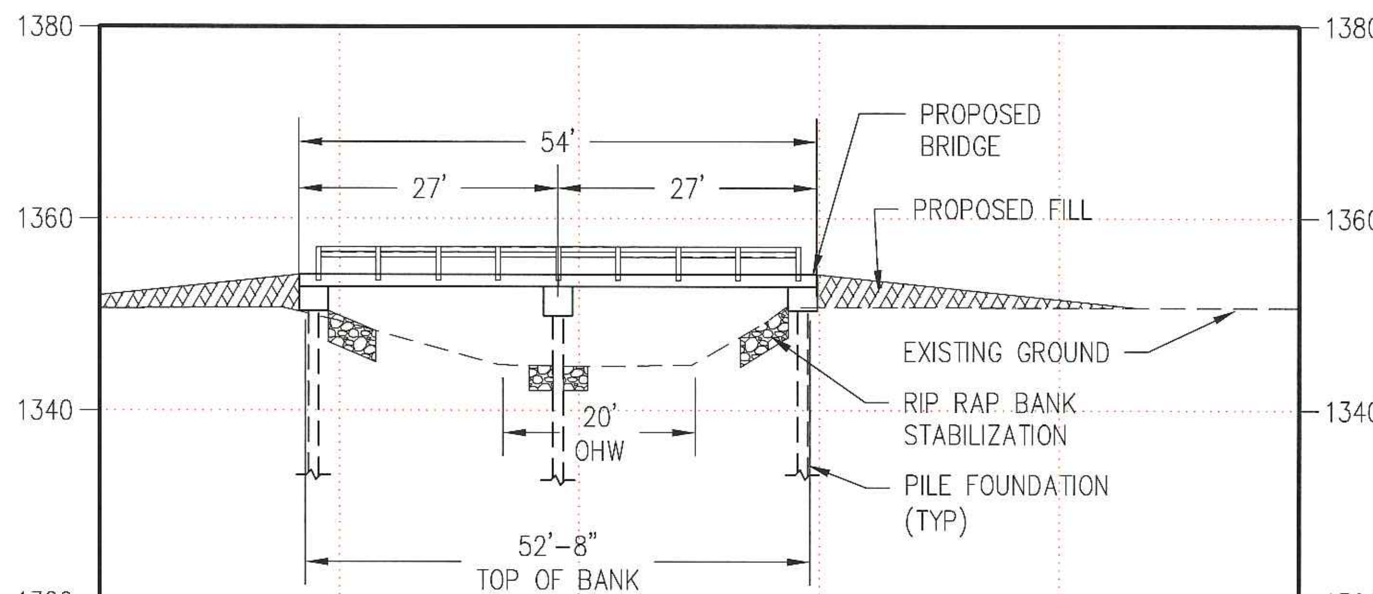


PLAN



TYPICAL SECTION
NOT TO SCALE



ELEVATION

CROSSING 5 - MULTI SPAN

PANOCHE VALLEY SOLAR FARM
PLAN, ELEVATION AND TYPICAL SECTION

WHPacific

PROJECT NUMBER	DRAWING FILE NAME	DATE
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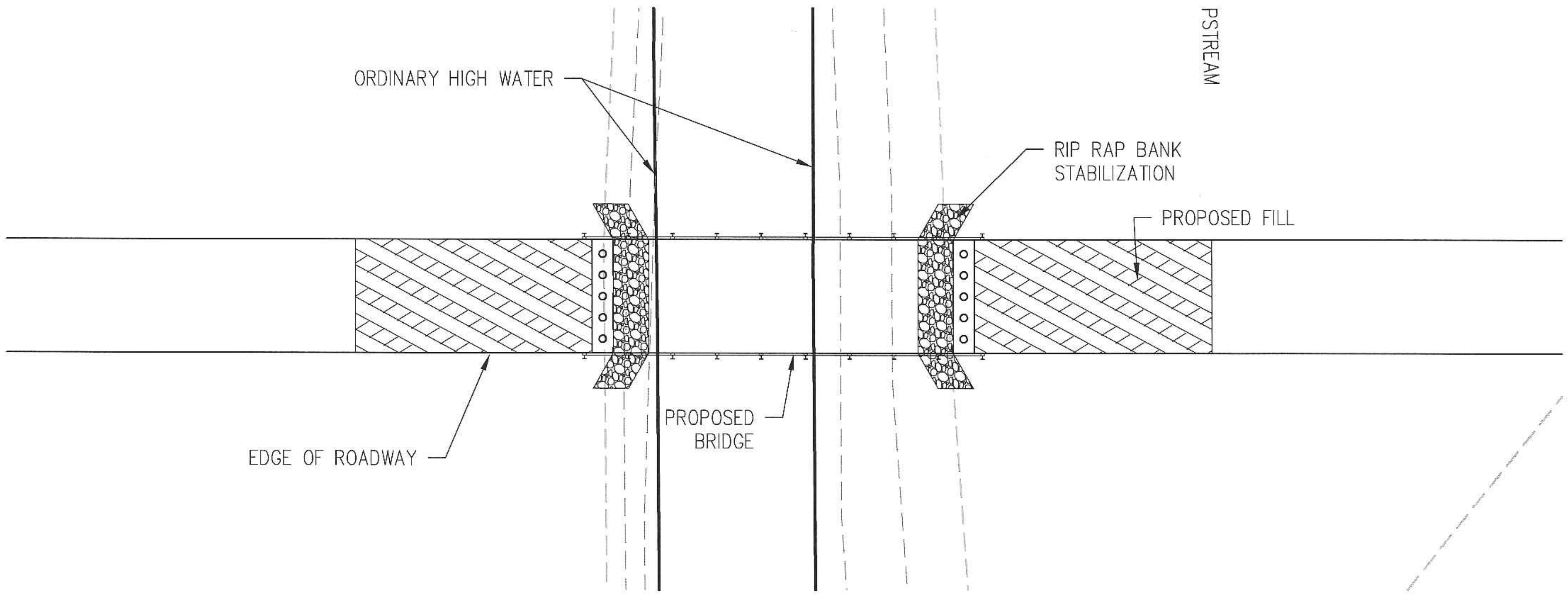
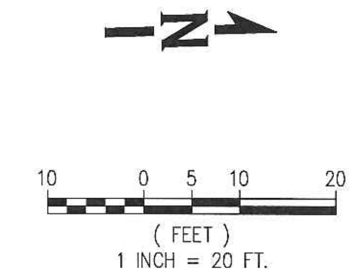
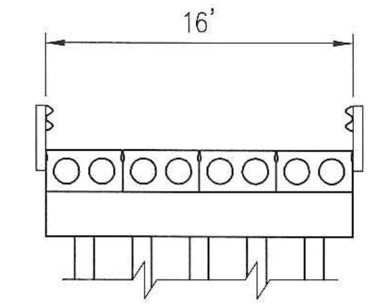
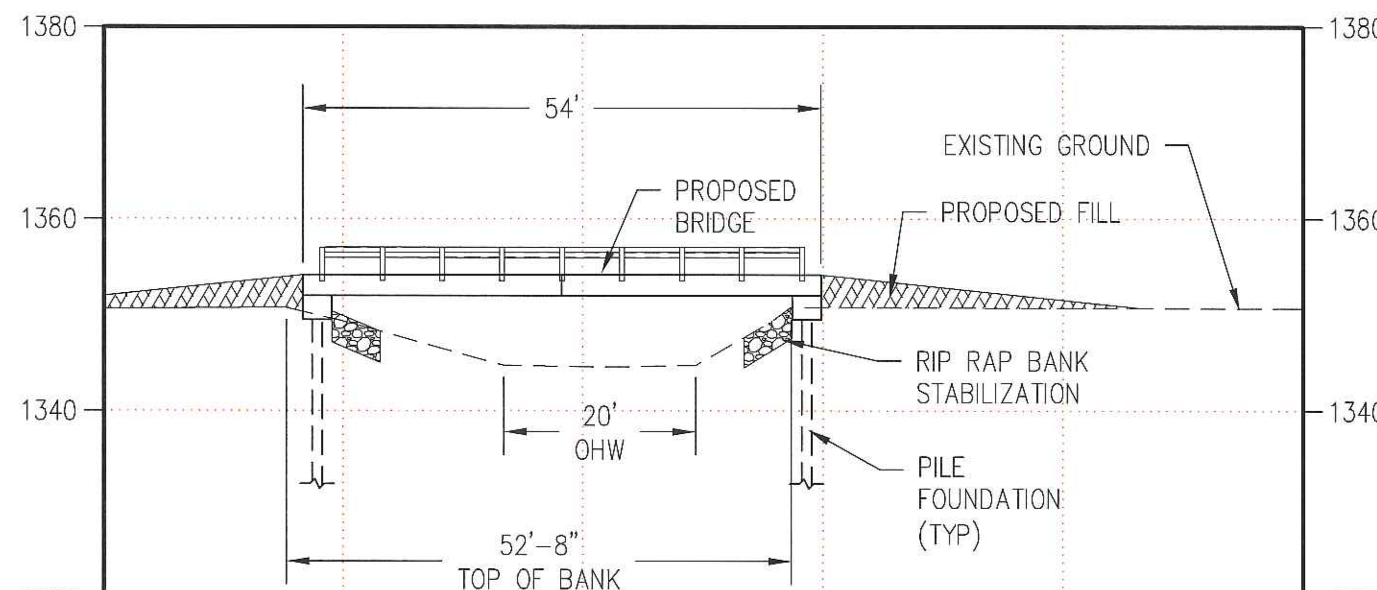


PLAN





TYPICAL SECTION
NOT TO SCALE



ELEVATION

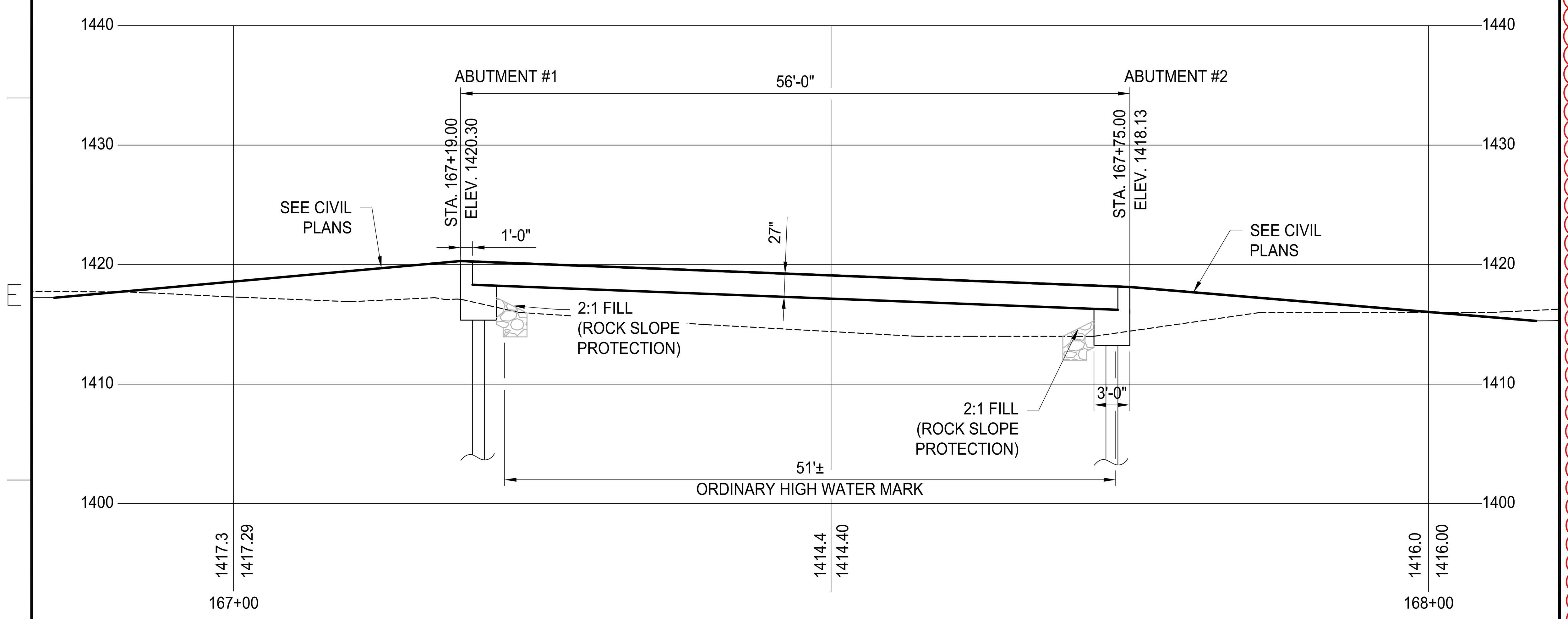
CROSSING 5 - SINGLE SPAN

PANOCHE VALLEY SOLAR FARM
PLAN, ELEVATION AND TYPICAL SECTION

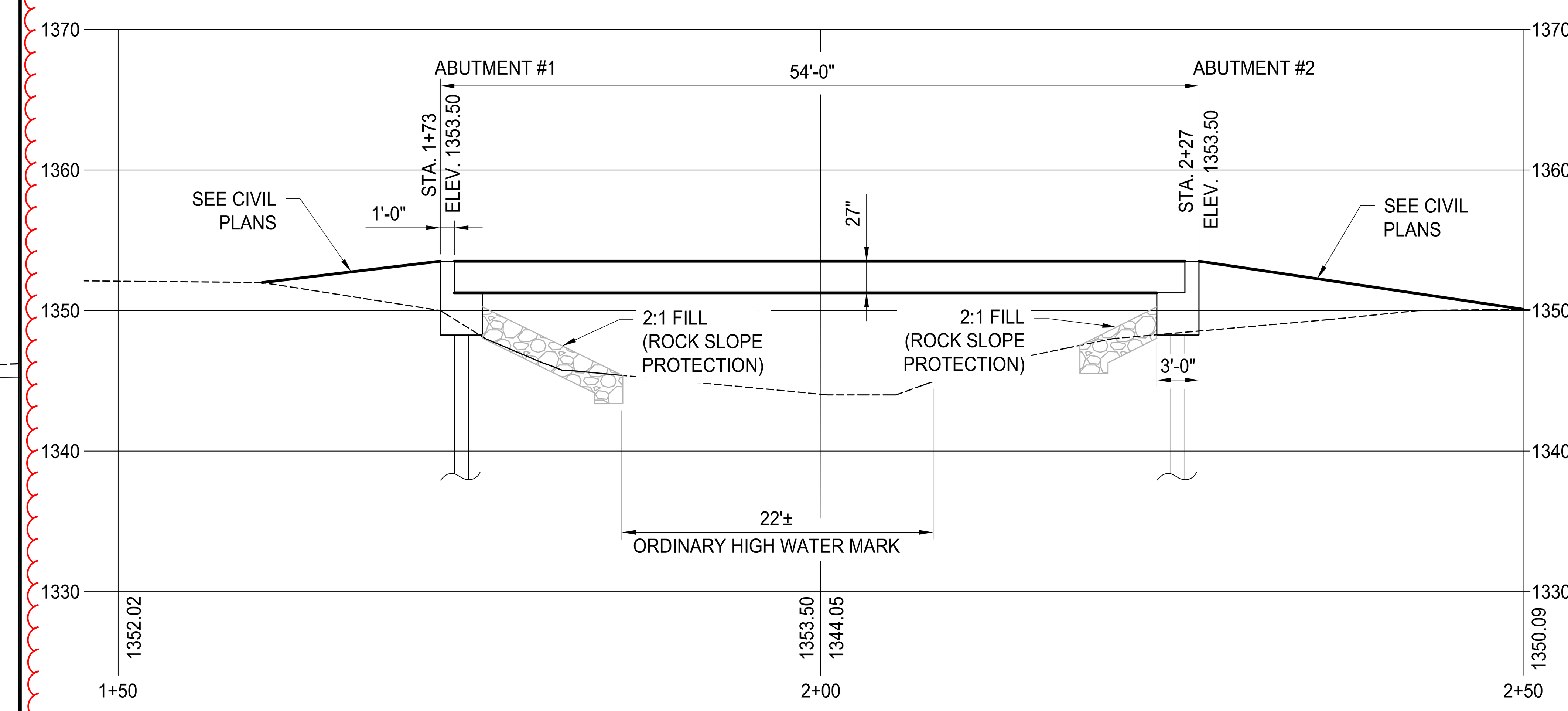
WHPacific

PROJECT NUMBER	DRAWING FILE NAME	DATE
035916	035916_EX02.dwg	10-08-13

APPENDIX F
Amec Foster Wheeler Plan Views



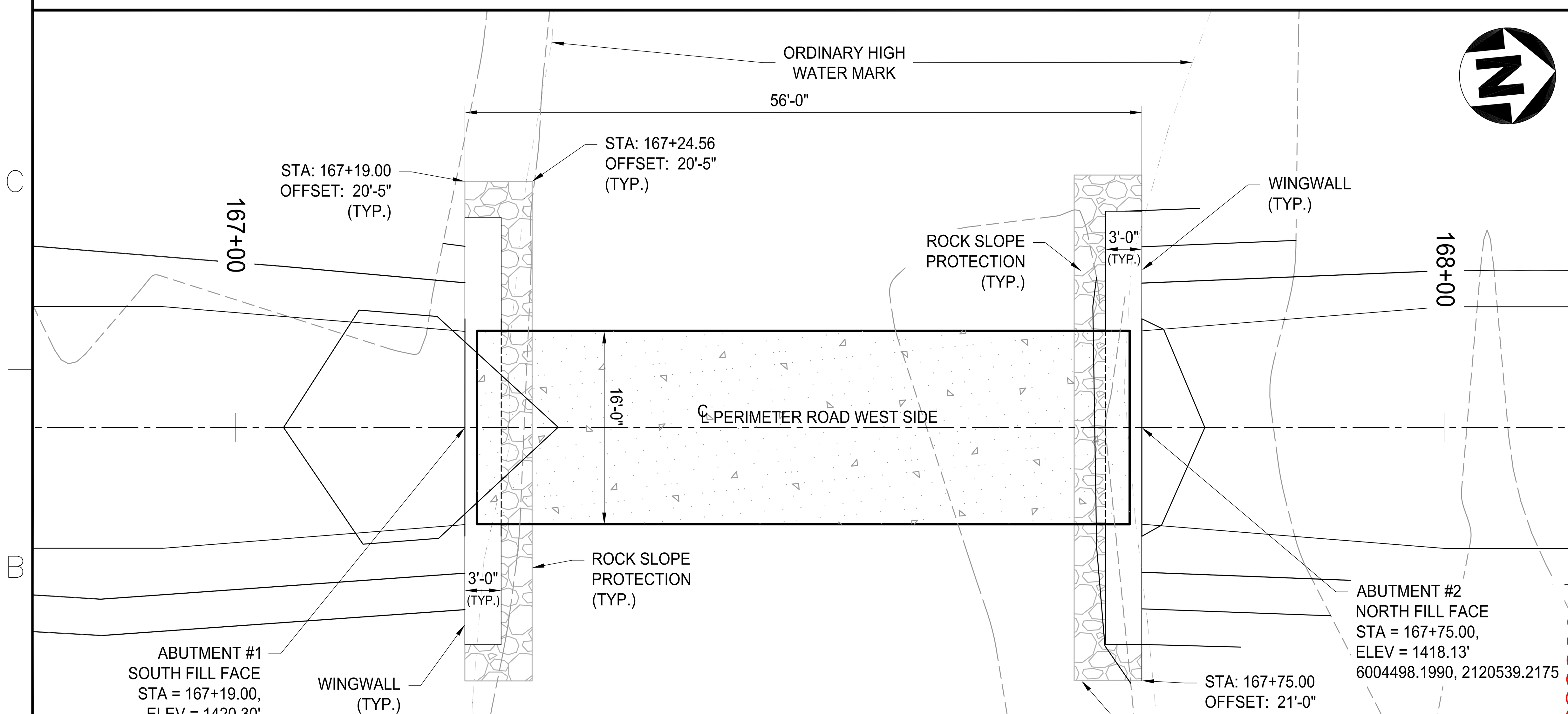
LAS AGUILAS CREEK
ELEVATION VIEW
N.T.S.



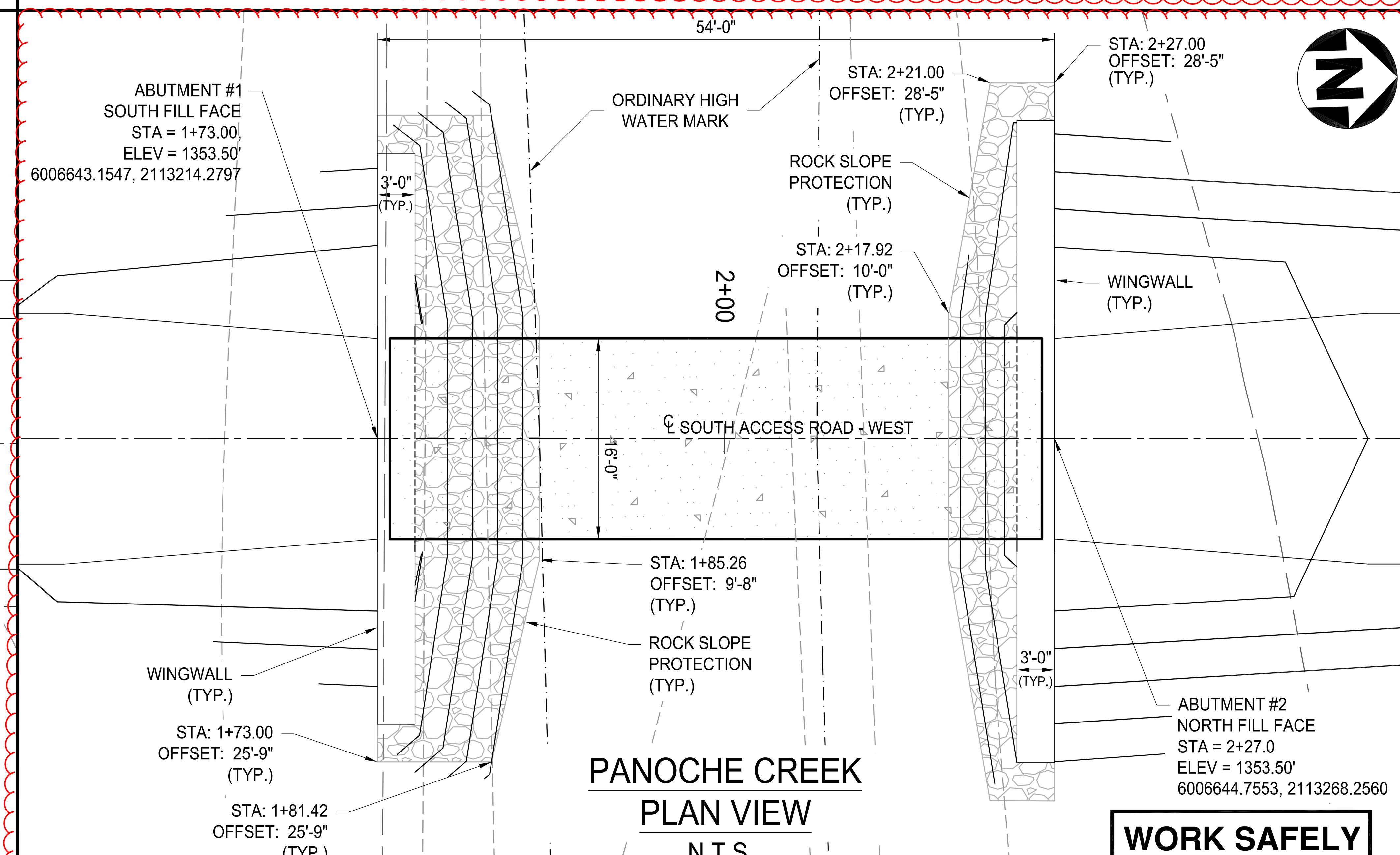
PANOCHE CREEK
ELEVATION VIEW
N.T.S.

The Panoche Creek bridge is no longer proposed.
REV.1 8-17-2015

NOTES
1. NOT TO SCALE
2. LAS AGUILAS CREEK BRIDGE:
   - TOTAL DISTURBED CHANNEL QUANTITIES INSIDE ORDINARY HIGH WATER LINE = 296 SQ. FT.
   - LOW CHORD ELEVATION = 1415.88'
   - HIGH WATER ELEVATION AT UPSTREAM FACE OF BRIDGE FOR 25 YEAR STORM = 1415.28'.
   - AREA OF WATERWAY OPENING = 125.92 FT^2
3. PANOCHE CREEK BRIDGE:
   - TOTAL DISTURBED CHANNEL QUANTITIES INSIDE ORDINARY HIGH WATER LINE = 2 SQ. FT.
   - LOW CHORD ELEVATION = 1351.25'
   - HIGH WATER ELEVATION AT UPSTREAM FACE OF BRIDGE FOR 25 YEAR STORM = 1350.58'.
   - AREA OF WATERWAY OPENING = 248 FT^2
4. SEE CIVIL SHEETS C-0139, C-0144, C-0145 FOR GRADING PLAN.



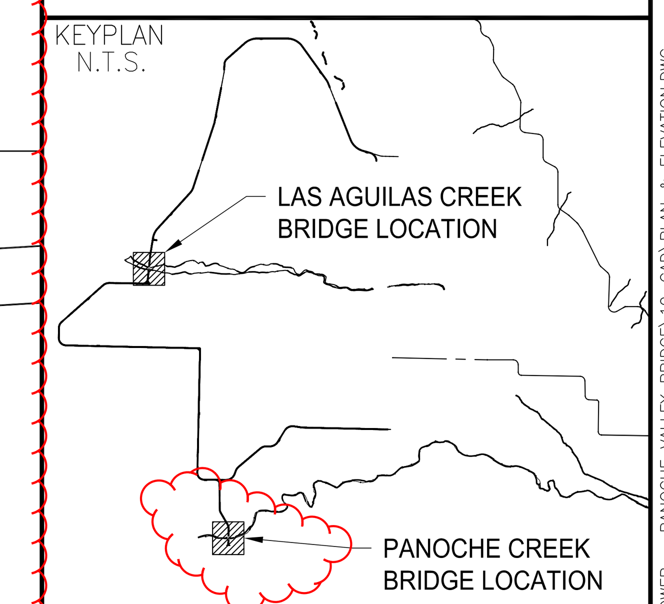
LAS AGUILAS CREEK
PLAN VIEW
N.T.S.



PANOCHE CREEK
PLAN VIEW
N.T.S.

WORK SAFELY

KEYPLAN
N.T.S.



STAMP/SEAL

REV	DDMMMYY	REVISION / ISSUE DESCRIPTION	DRN	CHK	APP	APP	APP	APP
A	24FEB15	ISSUED FOR PERMIT REVIEW	JLJ	JS	HRM			

REF	NUMBER	TITLE

APPROVED FOR PERMIT REVIEW
CLIENT PROJECT MGR. | DEPARTMENT MGR. TMB | PROJECT MGR. HRM
PROJECT PHASE: PANOCHE VALLEY SOLAR PROJECT
PROJECT NO. 176055 | ACTIVITY NO. | SCALE NTS | PACKAGE CODE

	BY	DDMMMYY
DES	RMK	02/2015
DRN	JLJ	02/2015
CHK	JS	02/2015
APP	HRM	02/2015

PANOCHE VALLEY SOLAR LLC

SUBJECT: CIVIL
BRIDGE CROSSINGS
GENERAL PLAN AND ELEVATION

amec

AREA
CLIENT DWG. NO.
DRAWING NO. D-000-C-0301
REV. A

NOTES
1. NOT TO SCALE

GENERAL NOTES:

SPECIFICATIONS:

DESIGN:
AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 6TH EDITION, WITH 2013 INTERIM REVISIONS.
CALTRANS BRIDGE DESIGN SPECIFICATIONS (2008 AMENDMENTS)

CONSTRUCTIONS:
2010 CALTRANS STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION

JOB SPECIAL PROVISIONS:
IN THE CASE OF A CONFLICT BETWEEN THE STANDARD SPECIFICATIONS THE JOB SPECIAL PROVISIONS AND THE PLANS THE JOB SPECIAL PROVISIONS SHALL GOVERN OVER THE STANDARD SPECIFICATIONS AND THE PLANS SHALL GOVERN OVER ALL SPECIFICATIONS.

DESIGN LOADS:

DEAD LOADS:

CONCRETE: 150 PCF
EARTH: 120 PCF
FUTURE WEARING SURFACE: 0 PCF

LIVE LOADS:

STRENGTH I: HL-93 (33% DYNAMIC LOAD ALLOWANCE)
STRENGTH II: CALTRANS P5 THRU P15 PERMIT VEHICLE

SEISMIC DESIGN:

IN ACCORDANCE WITH AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 6TH EDITION, WITH 2013 INTERIM REVISIONS SEISMIC PERFORMANCE ZONE: 4 BASED ON PEAK GROUND ACCELERATION COEFFICIENT, PGA = 0.449g, AND SITE MODIFIED SPECTRAL ACCELERATION COEFFICIENTS, SD1 = 0.601g.

DISTRIBUTION FACTORS:

LIVE LOAD DISTRIBUTION FACTOR IS ASSUMED TO BE .5 FOR SHEAR AND MOMENT FOR INTERIOR AND EXTERIOR BEAMS.
MULTIPRESENCE FACTOR = 1.0

ABUTMENTS:

INTEGRAL

MATERIALS:

CONCRETE:

ALL SITE CAST CONCRETE SHALL BE CALTRANS STRUCUTRAL CONCRETE, BRIDGE
WITH A MINIMUM 28-DAY COMPRESSIVE STRENGTH OF 3,600 PSI.
CHAMFER ALL EXPOSED EDGES OF CONCRETE 3/4 INCH, UNLESS NOTED OTHERWISE ON THE PLANS.
ABUTMENT CONCRETE: DO NOT PLACE ABUTMENT CONCRETE ABOVE THE BRIDGE SEAT CONSTRUCT IN JOINT UNTIL THE BOX BEAMS HAVE BEEN ERECTED.

REINFORCING STEEL:

ALL REINFORCING STEEL SHALL CONFORM TO ASTM A 615, GRADE 60 DEFORMED
MINIMUM CONCRETE COVER TO THE FACE OF ANY BAR SHALL NOT BE LESS THAN 2", UNLESS SHOWN OTHERWISE IN THE PLANS.
ALL REINFORCING STEEL SHALL BE EPOXY COATED

STEEL PILES:

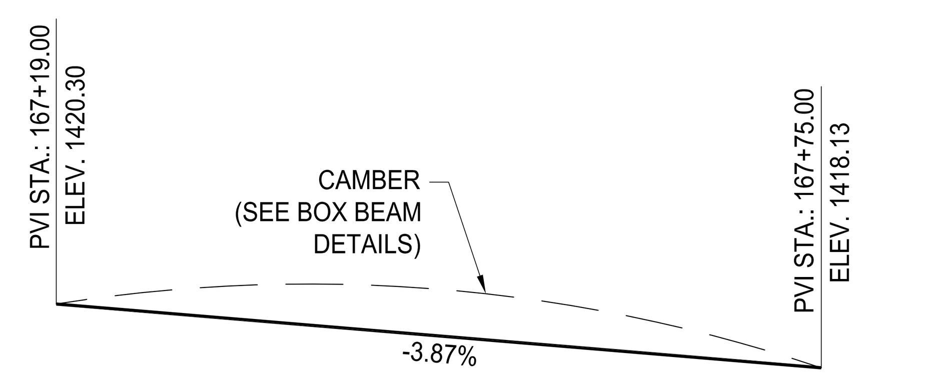
ALL PILES SHALL BE ASTM A709 GRADE 36
MANUFACTURED PILE POINT REINFORCEMENT SHALL BE USED ON ALL PILES IN THIS STRUCTURE
FOUNDATION LOADS SHOWN ON THE PLANS ARE SERVICE LOADS

PANOCHE BRIDGE QUANTITIES

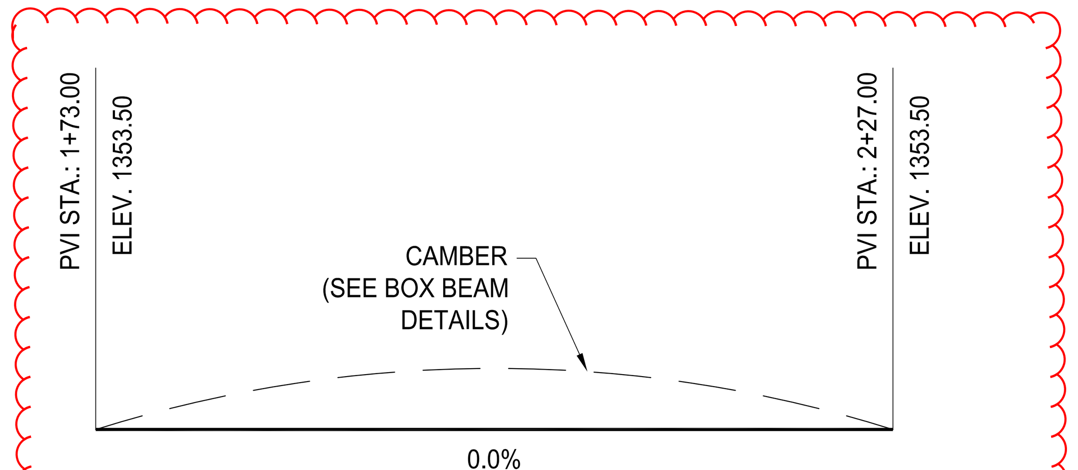
Caltrans ITEM No.	DESCRIPTION	EST. QTY	UNIT
760090	MOBILIZATION, DEMOBILIZATION, AND FINAL CLEANUP	1	LS
NA	Survey and Staking	1	LS
NA	Contractor Supplied Material Testing	1	LS
192001	STRUCTURE EXCAVATION (BRIDGE)	11	CY
721026	ROCK SLOPE PROTECTION (NO. 1, METHOD B) (CY)	21	CY
490513	FURNISH STEEL PILING (HP 12 X 53)	240	LF
490515	DRIVE STEEL PILE (HP 12 X 53)	8	EACH
510053	STRUCTURAL CONCRETE, BRIDGE	22	CY
520106	BAR REINFORCING STEEL (EPOXY COATED)	2500	LB
512222	FURNISH PRECAST PRESTRESSED CONCRETE BOX GIRDER (50'-60')	4	EACH
512502	ERECT PRECAST PRESTRESSED CONCRETE BOX GIRDER	4	EACH
NA	Bridge Mounted Twin Tube Steel Guardrail System	108	LF

LAS AGUILAS BRIDGE QUANTITIES

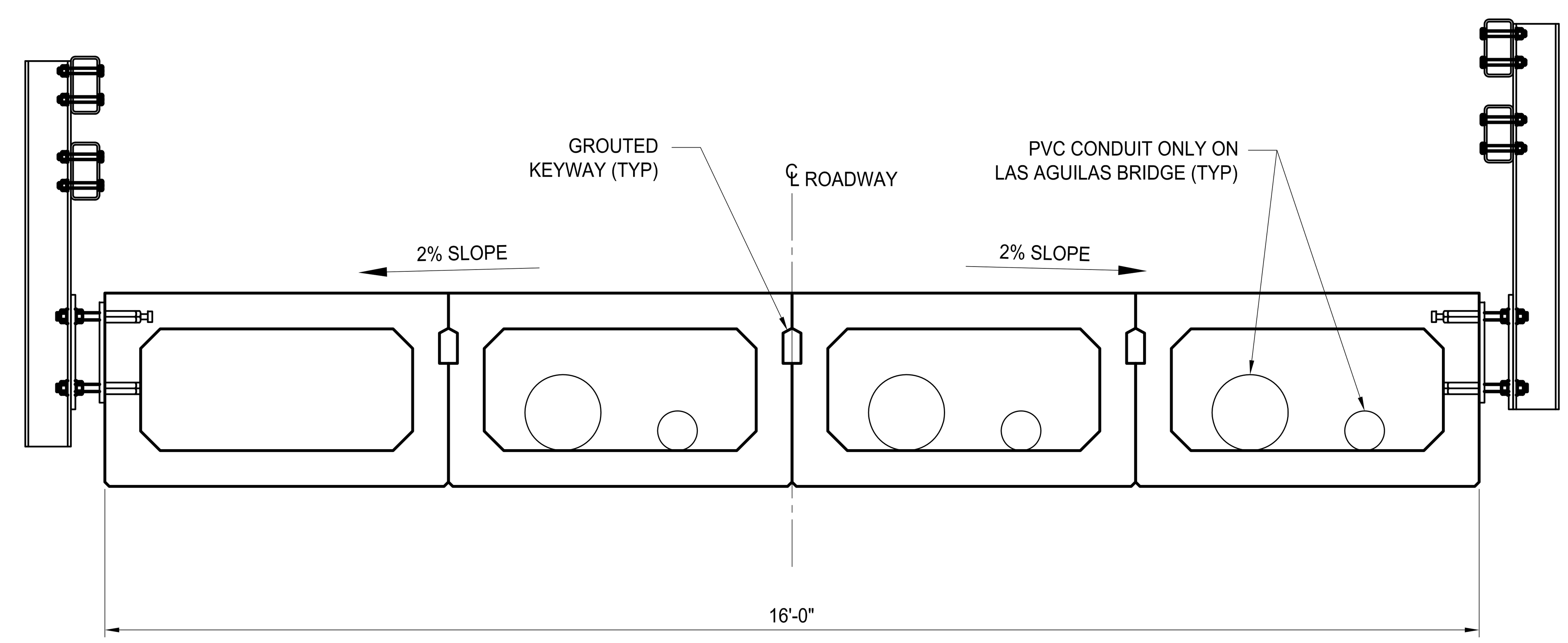
Caltrans ITEM No.	DESCRIPTION	EST. QTY	UNIT
760090	MOBILIZATION, DEMOBILIZATION, AND FINAL CLEANUP	1	LS
NA	Survey and Staking	1	LS
NA	Contractor Supplied Material Testing	1	LS
192001	STRUCTURE EXCAVATION (BRIDGE)	15	CY
721026	ROCK SLOPE PROTECTION (NO. 1, METHOD B) (CY)	14	CY
490513	FURNISH STEEL PILING (HP 12 X 53)	240	LF
490515	DRIVE STEEL PILE (HP 12 X 53)	8	EACH
510053	STRUCTURAL CONCRETE, BRIDGE	22	CY
520106	BAR REINFORCING STEEL (EPOXY COATED)	2500	LB
512222	FURNISH PRECAST PRESTRESSED CONCRETE BOX GIRDER (50'-60')	4	EACH
512502	ERECT PRECAST PRESTRESSED CONCRETE BOX GIRDER	4	EACH
NA	Bridge Mounted Twin Tube Steel Guardrail System	112	LF



LAS AGUILAS BRIDGE PROFILE GRADE



PANOCHE BRIDGE PROFILE GRADE



BRIDGE ELEVATION

WORK SAFELY

KEYPLAN

REV	DDMMMYY	REVISION / ISSUE DESCRIPTION	DRN	CHK	APP	APP	APP	APP
A	24FEB15	ISSUED FOR PERMIT REVIEW	JLJ	JS	HRM			

REF	NUMBER	TITLE

REFERENCES

STAMP/SEAL

APPROVED FOR PERMIT REVIEW

CLIENT PROJECT MGR.	DEPARTMENT MGR.	PROJECT MGR.
	TMB	HRM

PROJECT PHASE: PANOCHE VALLEY SOLAR PROJECT

PROJECT NO.: 176055
ACTIVITY NO.:
SCALE: NTS
PACKAGE CODE:

	BY	DDMMMYY
DES	RMK	02/2015
DRN	JLJ	02/2015
CHK	JS	02/2015
APP		

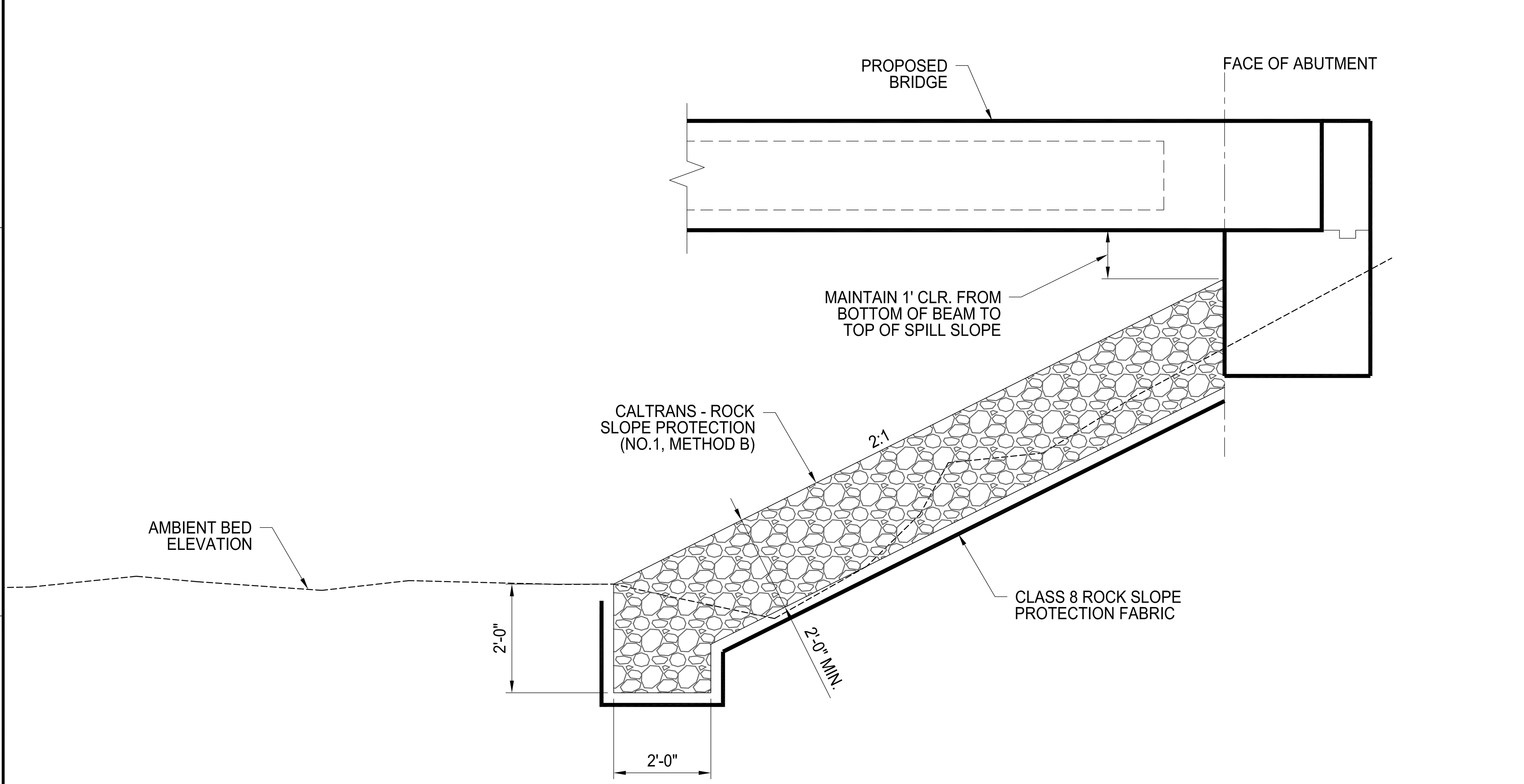
PANOCHE VALLEY SOLAR LLC

SUBJECT: CIVIL
BRIDGE CROSSINGS
GENERAL NOTES AND QUANTITIES

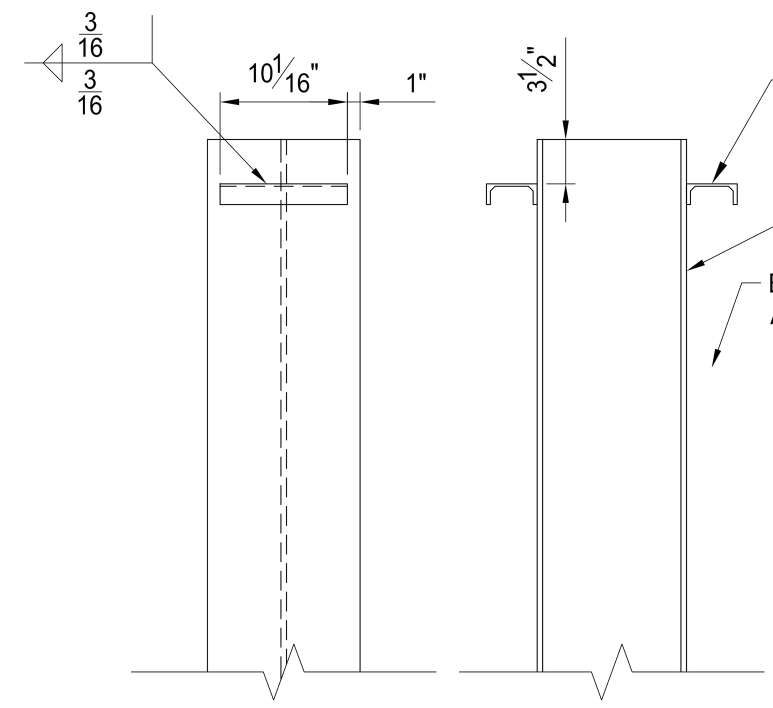
amec

AREA:
CLIENT DWG. NO.:
DRAWING NO.: D-000-C-0302
REV.: A

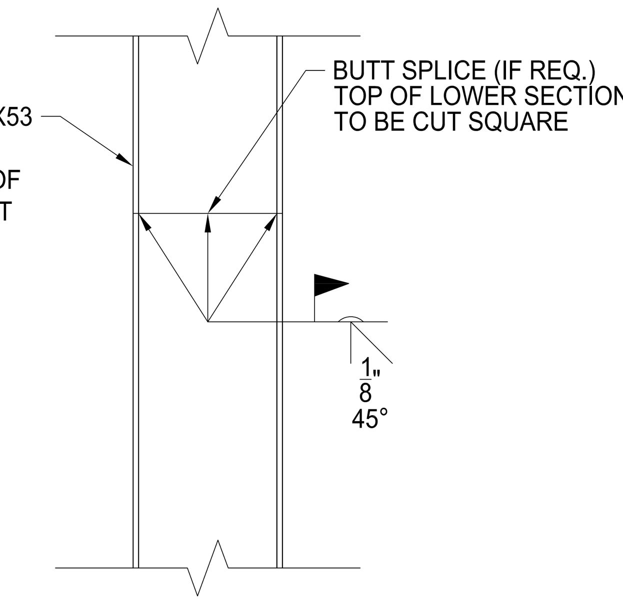
NOTES
1. NOT TO SCALE
2. SEE CIVIL PLANS FOR GRADING LIMITS.
3. ROCK SLOPE PROTECTION DETAIL IS TYPICAL FOR BOTH BRIDGES.



ROCK SLOPE PROTECTION
N.T.S.



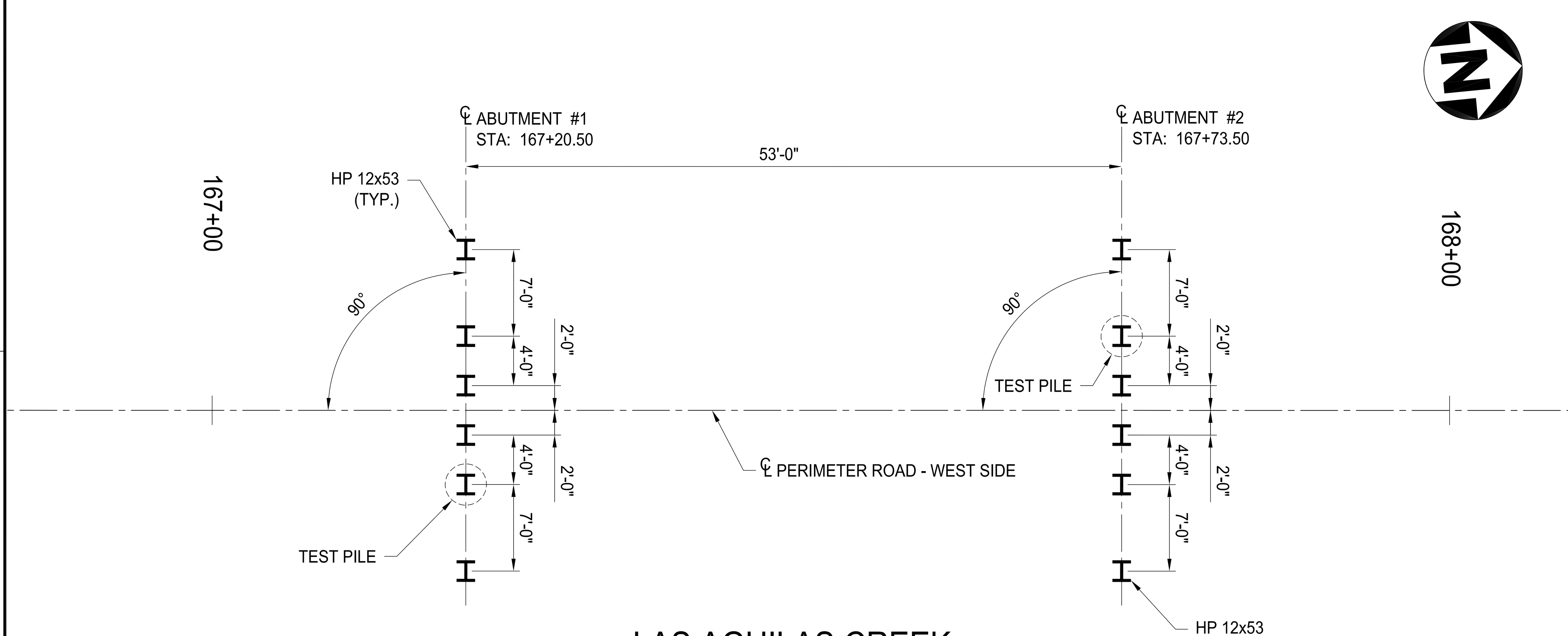
TYPICAL PILE CHANNEL SHEAR CONNECTOR DETAIL



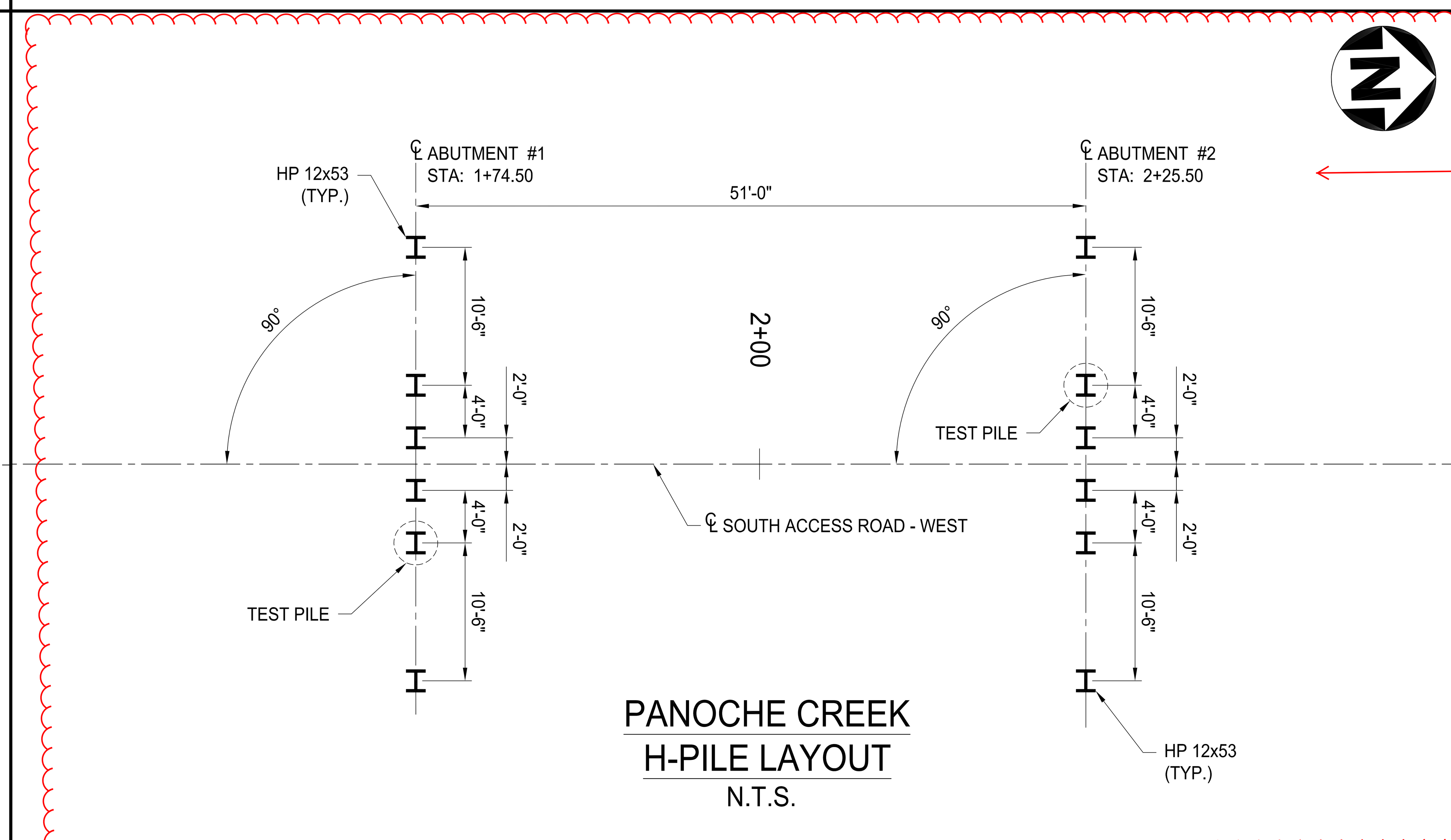
STEEL PILE SPLICE DETAIL

PILE DATA				
	Las Aguilas Bridge		Panoche Bridge	
	Abutment # 1	Abutment # 2	Abutment # 1	Abutment # 2
Shape	HP12x53	HP12x53	HP12x53	HP12x53
Pile Type	Friction	Friction	Friction	Friction
Number	6	6	6	6
Approx. Length (ft.)	32	32	32	32
Pile Axial Service Load (kips)	80	80	80	80
Pile Driving Verification Method	PDA	PDA	PDA	PDA

PILE NOTES:
1. Estimated Pile Length includes 18" embendment in Abutment
2. See project special provisions for PDA testing requirements
3. Cost of channel shear connectors C4x5.4 (ASTM-A709 Grade 50) in place to be included in contract unit prices for structural steel piles.
4. Manufactured pile point reinforcement shall be used on all piles in this structure.



LAS AGUILAS CREEK H-PILE LAYOUT
N.T.S.



PANOCHE CREEK H-PILE LAYOUT
N.T.S.

The Panoche Creek bridge is no longer proposed.
REV.1 8-17-2015

WORK SAFELY

KEYPLAN

REV	DDMMMYY	REVISION / ISSUE DESCRIPTION	DRN	CHK	APP	APP	APP	APP
A	24FEB15	ISSUED FOR PERMIT REVIEW	JLJ	JS	HRM			

REF	NUMBER	TITLE

REFERENCES

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TMB | HRM
CLIENT PROJECT MGR. | DEPARTMENT MGR. | PROJECT MGR.
PROJECT PHASE: PANOCHE VALLEY SOLAR PROJECT

PANOCHE VALLEY SOLAR LLC

amec

PROJECT NO.	ACTIVITY NO.		BY	DDMMMYY
176055		DES	RMK	02/2015
SCALE	PACKAGE CODE	DRN	JLJ	02/2015
NTS		CHK	JS	02/2015
		APP	HRM	02/2015

SUBJECT: CIVIL
BRIDGE CROSSINGS
PILE LAYOUT AND ROCK SLOPE PROTECTION DETAILS

AREA
CLIENT DWG. NO.
DRAWING NO. D-000-C-0303
REV. A

GENERAL NOTES FOR PRESTRESSED BOX BEAMS:

DESIGN STRESSES:

PRESTRESSED CONCRETE
F'c = 6,000PSI (28-DAY)
F'ci = 4,500PSI (RELEASE)

CAST-IN-PLACE CONCRETE:
F'C = 4,500 PSI

REINFORCING STEEL:
MIN. YIELD STRENGTH = 60,000 PSI.

PRESTRESSING STRAND:
FURNISH MATERIAL CONFORMING TO (ASTM A416), GRADE 270, and LOW RELAXATION, UNCOATED, SEVEN WIRE STRAND. STRANDS SHALL BE 0.5 INCH DIAMETER WITH A TOTAL CROSS SECTIONAL AREA OF 0.153 IN². INITIAL JACKING FORCE SHALL BE 30,900 POUNDS PER STRAND.

TRANSVERSE TIE RODS SHALL BE 1" DIAMETER STEEL RODS CONFORMING TO ASTM A311, GRADE 1018, AND THREADED AT EACH END. PROVIDE A NUT AND WASHER AT EACH END. THREADS MAY BE CUT OR ROLLED. IF ROLLED THREADS ARE USED, THE MINIMUM DIAMETER AT THE ROOT OF THE THREADS SHALL BE 0.838". INSTALL AND TORQUE RODS TO APPROXIMATELY 250 FT-LBS. AFTER TIGHTENING, FILL THE RECESSES IN THE FASCIA BEAMS WITH NON SHRINK MORTAR OF THE SAME COLOR AS THE BEAM.

GALVANIZING:
GALVANIZE ANCHOR DOWEL BARS, INSERTS, TIE RODS, NUTS AND WASHERS ACCORDING TO ASTM A153.

ANCHOR DOWELS SHALL BE 1" DIAMETER SMOOTH STEEL RODS CONFORMING TO ASTM A311, GRADE 1018.

LOCATE THE ANCHOR DOWEL HOLES AND PRESTRESSING STRANDS TO AVOID MUTUAL INTERFERENCE. THE LATERAL SPACING OF THE HOLES IN THE BEAM SHALL BE AS CLOSE TO THE CENTERLINE OF BEAM AS POSSIBLE.

AFTER TENSIONING OF THE TRANSVERSE TIE RODS, DRILL 1 1/16" MINIMUM DIAMETER DOWEL HOLES FOR FIXED DOWELS INTO THE ABUTMENT. CLEAN AND DRY DOWEL HOLES AND INSTALL DOWELS.

BEAM ENDS:
SHALL BE SANDBLASTED PRIOR TO POURING ABUTMENT DIAPHRAGM CONCRETE.

DRIP GROOVES ON THE UNDERSIDE OF THE FASCIA BEAM ARE NOT PERMITTED.

SURFACE PREPARATION FOR MORTAR:
THE FABRICATOR SHALL SANDBLAST THE KEYWAY SURFACES WITHIN FOUR DAYS OF SHIPMENT TO THE PROJECT SITE. THE SANDBLASTING SHALL YIELD A VISUAL APPEARANCE AND TEXTURE EQUAL OR ROUGHER THAN 100 GRIT SANDPAPER OVER THE ENTIRE KEYWAY SURFACE. WHEN STAINS ARE VISIBLE BEFORE BLASTING THE CONCRETE, USE A DEGREASER TO ENSURE REMOVAL OF GREASE, OILS ANDOTHER SIMILAR CONTAMINATES. THE DEGREASER SHALL BE WATER SOLUBLE SO IT CAN BE REMOVED BEFORE THE BLASTING BEGINS. BEFORE MORTARING, REMOVE ALL DIRT, DUST, GREASE, OIL AND OTHER FOREIGN MATERIAL FROM THE SURFACES USING A HIGH PRESSURE WASH OF AT LEAST 1000 PSI AT A DELIVERY RATE OF AT LEAST 4 GAL/MIN.

MORTAR:
MORTAR OR GROUT FOR TIE ROD RECESSES, ANCHOR DOWEL HOLES AND KEYWAYS BETWEEN PRESTRESSED CONCRETE BOX BEAMS, SHALL BE A NON-SHRINK TYPE AS DESCRIBED. DURING THE GROUTING OPERATION, PREPARE AT LEAST THREE, 3" DIAMETER BY 6" LONG TEST CYLINDERS OF THE GROUTING MATERIAL. SUBMIT THE CYLINDERS TO THE CONTRACTOR'S LABORATORY TO DETERMINE THE MINIMUM COMPRESSIVE STRENGTH OF THE GROUT.

FURNISH MORTAR AS HIGH EARLY STRENGTH GROUT. AFTER THE TIE RODS ARE TIGHTENED, PREPARE, PLACE AND CURE THE MORTAR ACCORDING TO THE MANUFACTURER'S SPECIFICATIONS. PLACE MORTAR IN A MANNER THAT ENSURES COMPLETE AND SOLID FILLING. THE MINIMUM STRENGTH OF THE MORTAR SHALL BE 5000 PSI BEFORE CONSTRUCTION OR VEHICULAR TRAFFIC IS ALLOWED ON THE BEAMS.

BASIS OF PAYMENT: ALL COSTS ASSOCIATED WITH FURNISHING AND INSTALLING THE BOX BEAMS KEYWAY GROUT, ANCHOR DOWELS AND ROOFING FELT IS CONSIDERED INCIDENTAL TO THE BOX BEAMS

FABRICATOR'S SHOP DRAWINGS SHALL SHOW COMPLETE DETAILS OF BEAM REINFORCING.

NOTES
1. NOT TO SCALE

KEYPLAN

WORK SAFELY

REV	DDMMMYY	REVISION / ISSUE DESCRIPTION	DRN	CHK	APP	APP	APP	APP
A	24FEB15	ISSUED FOR PERMIT REVIEW	JLJ	JS	HRM			

REF	NUMBER	TITLE

REFERENCES

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CLIENT PROJECT MGR.	DEPARTMENT MGR.	PROJECT MGR.
	TMB	HRM

PROJECT PHASE: PANOCHE VALLEY SOLAR PROJECT

PANOCHE VALLEY SOLAR LLC

amec

PROJECT NO.	ACTIVITY NO.		BY	DDMMMYY
176055		DES	RMK	02/2015
SCALE	PACKAGE CODE	DRN	JLJ	02/2015
NTS		CHK	JS	02/2015
		APP	HRM	02/2015

SUBJECT
CIVIL
BRIDGE CROSSINGS
GENERAL NOTES FOR BOX BEAMS

AREA

CLIENT DWG. NO.

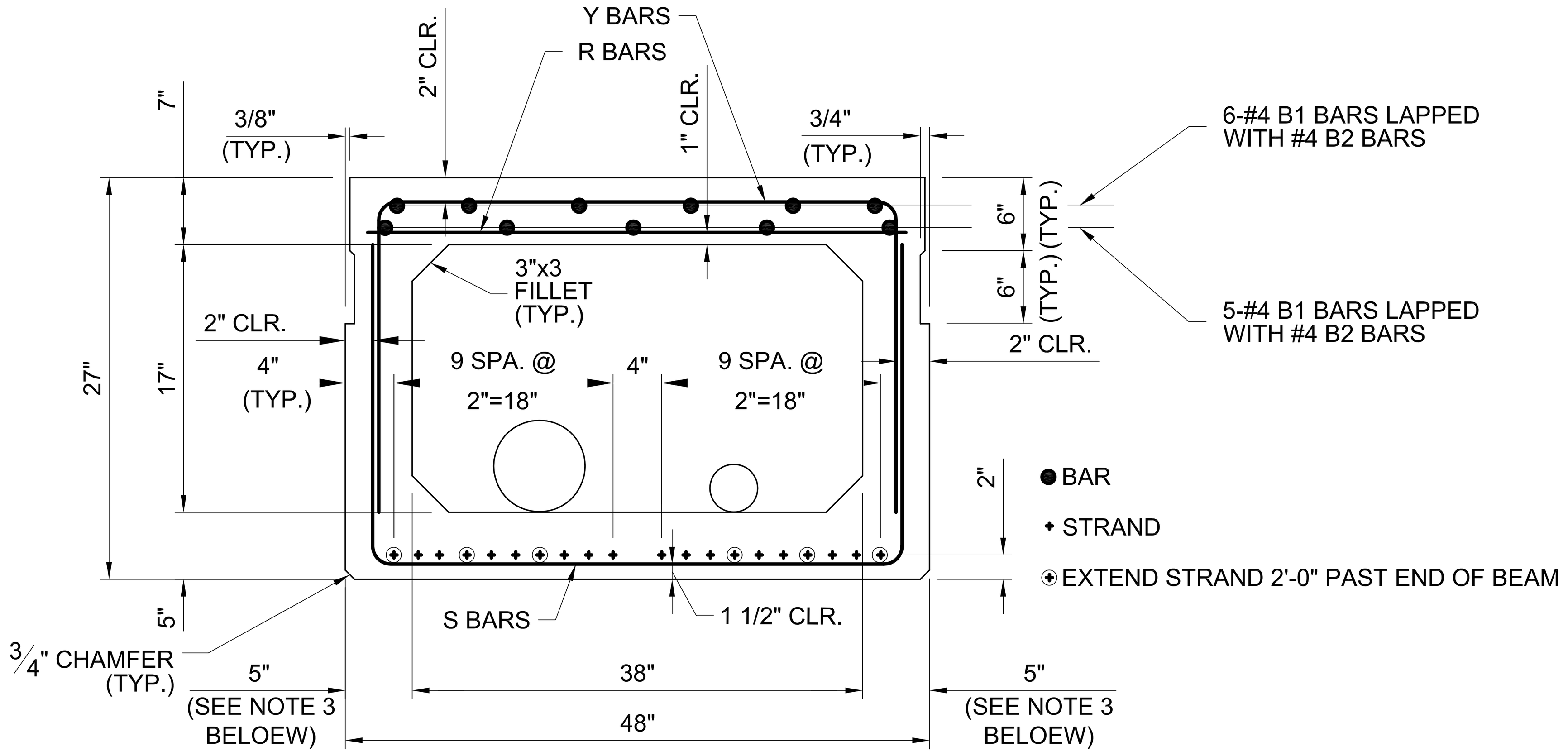
DRAWING NO. D-000-C-0304 REV. A

CAD FILE: P:\STLOUIS\2015\325115001 - AMEC POWER - PANOCHE VALLEY BRIDGE\10-CAD\BOX BEAM DETAILS.DWG

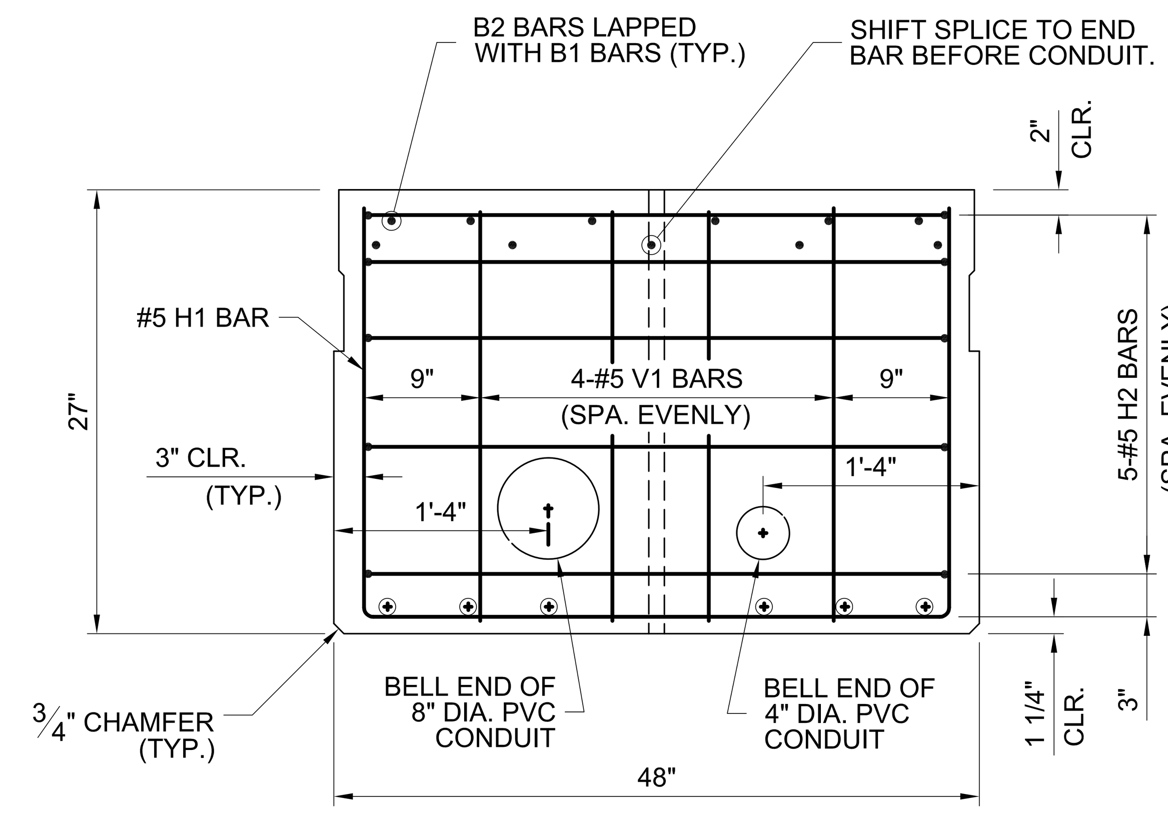
SAVED: 23-Feb-15 3:47 PM PLOTTED: 23-Feb-15 4:03 PM USER: JOHNSON, JEFFERY L.

ARCH D-24x36

LAS AGUILAS BRIDGE



27X48 BOX BEAM

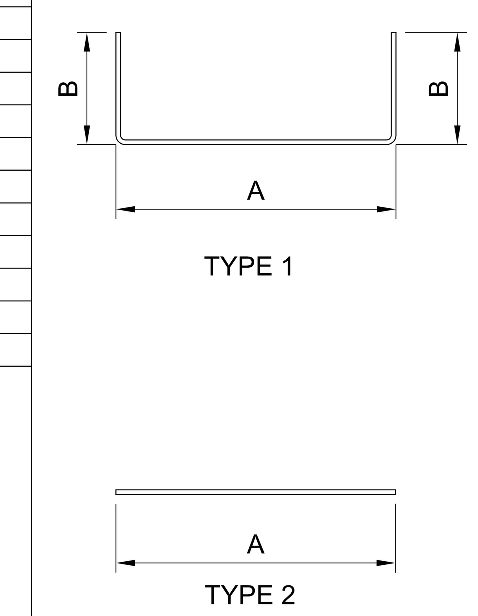


⊙ EXTEND STRAND 2'-0" PAST END OF BEAM

SHIFT BARS TO CLEAR CONDUIT

END VIEW OF BEAM

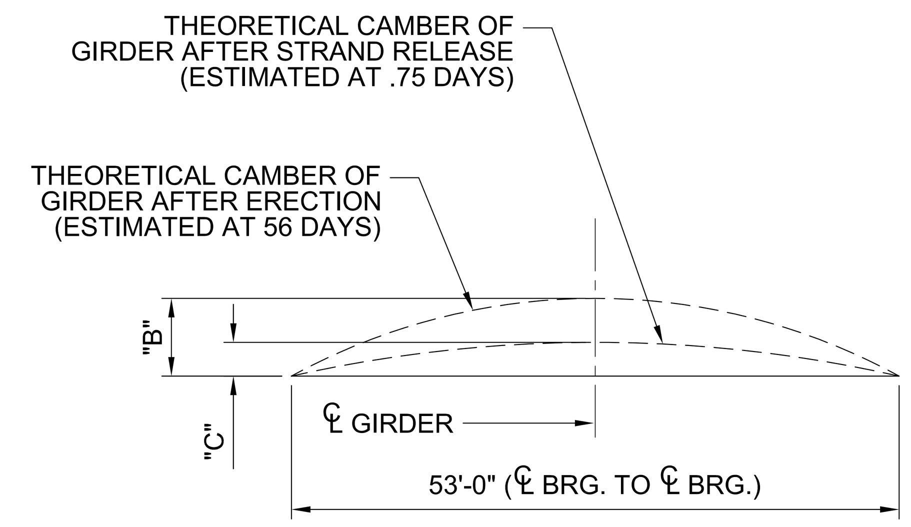
REINFORCING SCHEDULE

REINFORCING BARS								
SIZE	MARK	TYPE	A	B	C	D	E	BENDING DIAGRAMS
#4	R1	2	44"					
#4	S1	1	44"	21"				
#4	Y1	1	44"	20"				
#4	B1	2	32'-0"					
#4	B2	2	16'-0"					
#5	H1	1	42"	23"				
#5	H2	1	41"	18"				
#5	V1	2	23"					

FABRICATOR'S SHOP DRAWINGS SHALL SHOW COMPLETE DETAILS OF BEAM REINFORCING.

NOTES
1. NOT TO SCALE
2. ELECTRICAL CONDUIT NOTES:

- REFERENCE ELECTRICAL CONDUIT DETAIL ON D-000-E-0257
- PVC CONDUIT SHALL BE SCHEDULE 80 WITH THICKNESS = 0.337" FOR 4" AND THICKNESS = 0.5" FOR 8"
- CONDUIT ONLY NEEDED ON THREE EAST MOST BOX BEAMS, CONDUITS SHALL BE SHOWN ON THE SHOP DRAWINGS.



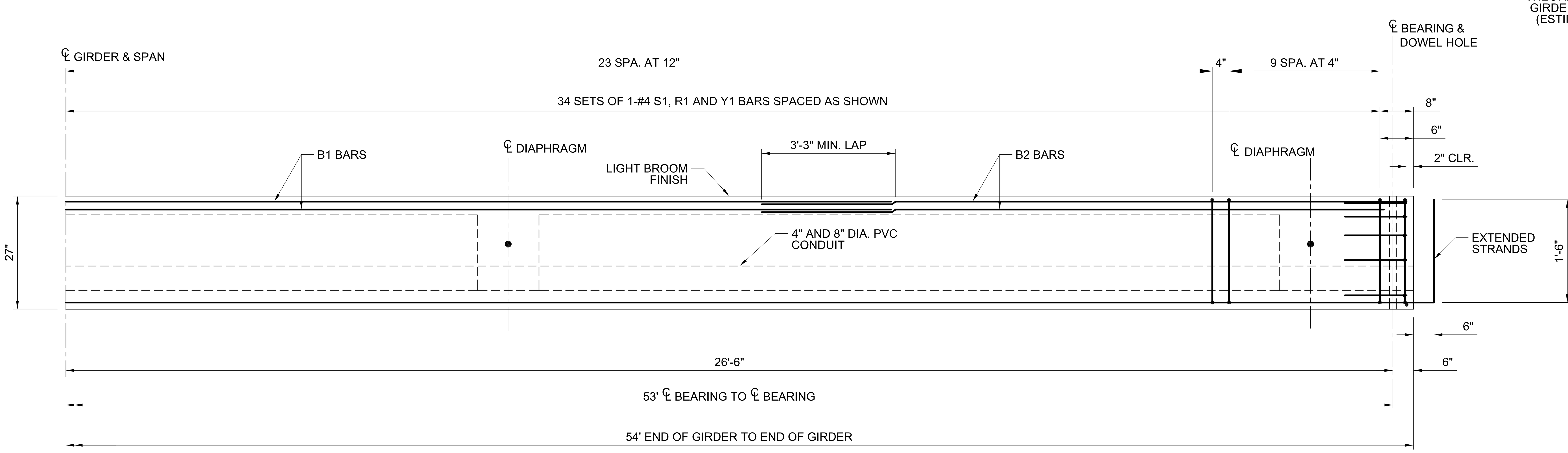
	"B"	"C"
INT. & EXT. GIRDER	$1\frac{3}{8}$"	$\frac{7}{8}$"

CONVERSION FACTOR FOR GIRDER CAMBER
0.25 PT. = 0.7125 X 0.5 PT.

GIRDER CAMBER DIAGRAM

ALLOWABLE CAMBER VARIATION FROM DESIGN CAMBER = +/- 1/2" MAX.

ALLOWABLE DIFFERENTIAL CAMBER BETWEEN ADJACENT MEMBERS OF THE SAME DESIGN = 1/2" MAX. (INCLUDES DIFFERENTIAL CAMBER FOR ADJACENT BEAMS)



ELEVATION

BOX BEAM GENERAL NOTES:
1) GIRDER IS SYMMETRICAL ABOUT CENTERLINE SPAN
2) SHIFT SHEAR BARS AS NEEDED TO CLEAR TRANSVERSE TIE ROD
3) COORDINATE BOX BEAM DETAILS WITH RAILING DETAILS FOR ADDITIONAL REQUIREMENTS OF EMBEDED COMPONENTS.

WORK SAFELY

KEYPLAN

REV	DDMMMYY	REVISION / ISSUE DESCRIPTION	DRN	CHK	APP	APP	APP	APP
A	24FEB15	ISSUED FOR PERMIT REVIEW	JLJ	JS	HRM			

REF	NUMBER	TITLE
	REFERENCES	

STAMP/SEAL

APPROVED FOR PERMIT REVIEW
TMB HRM
CLIENT PROJECT MGR. DEPARTMENT MGR. PROJECT MGR.

PROJECT PHASE: PANOCHE VALLEY SOLAR PROJECT

PANOCHE VALLEY SOLAR LLC

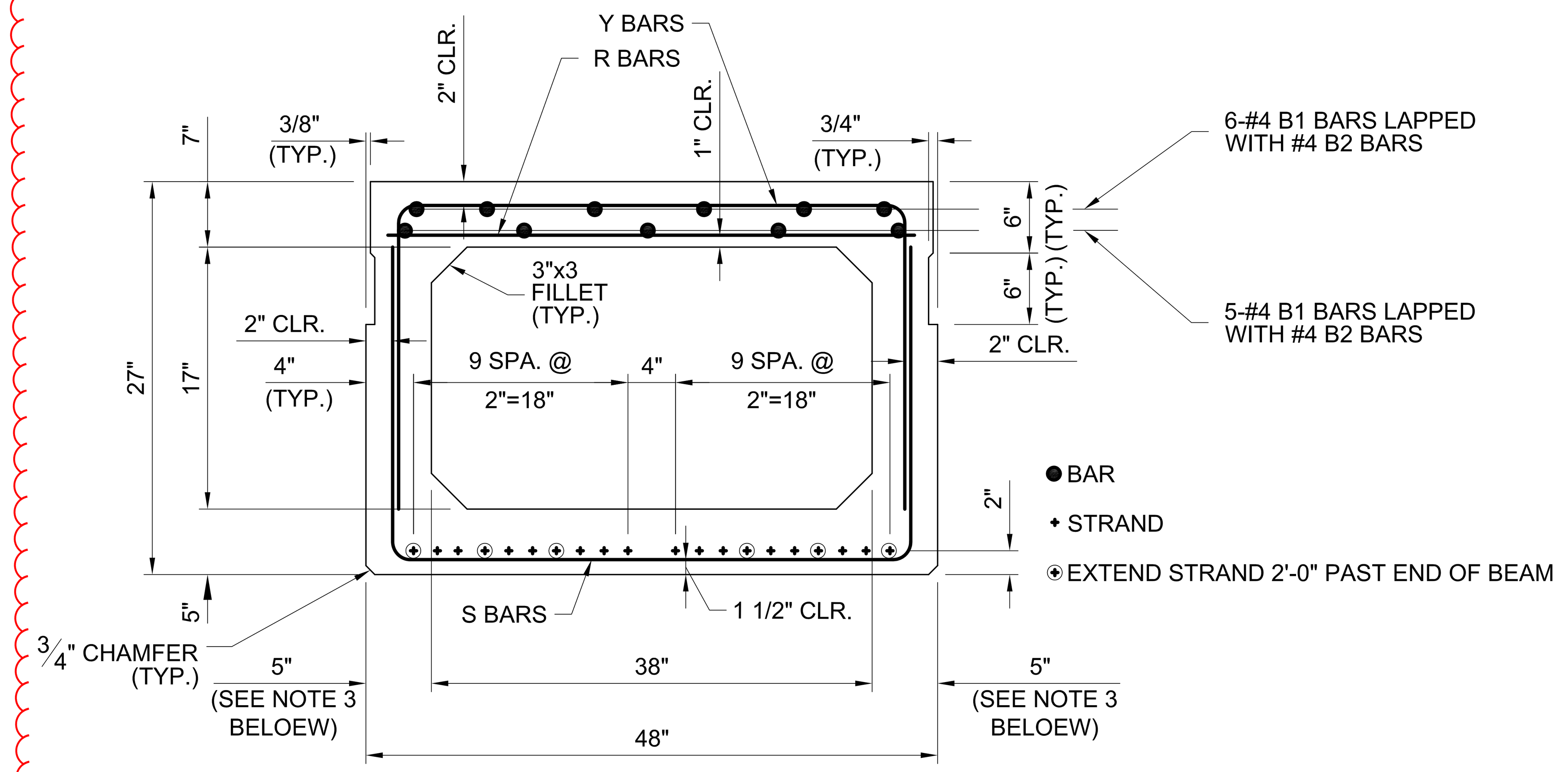
amec

PROJECT NO.	ACTIVITY NO.		BY	DDMMMYY
176055		DES	RMK	02/2015
SCALE	PACKAGE CODE	DRN	JLJ	02/2015
NTS		CHK	JS	02/2015
		APP	HRM	02/2015

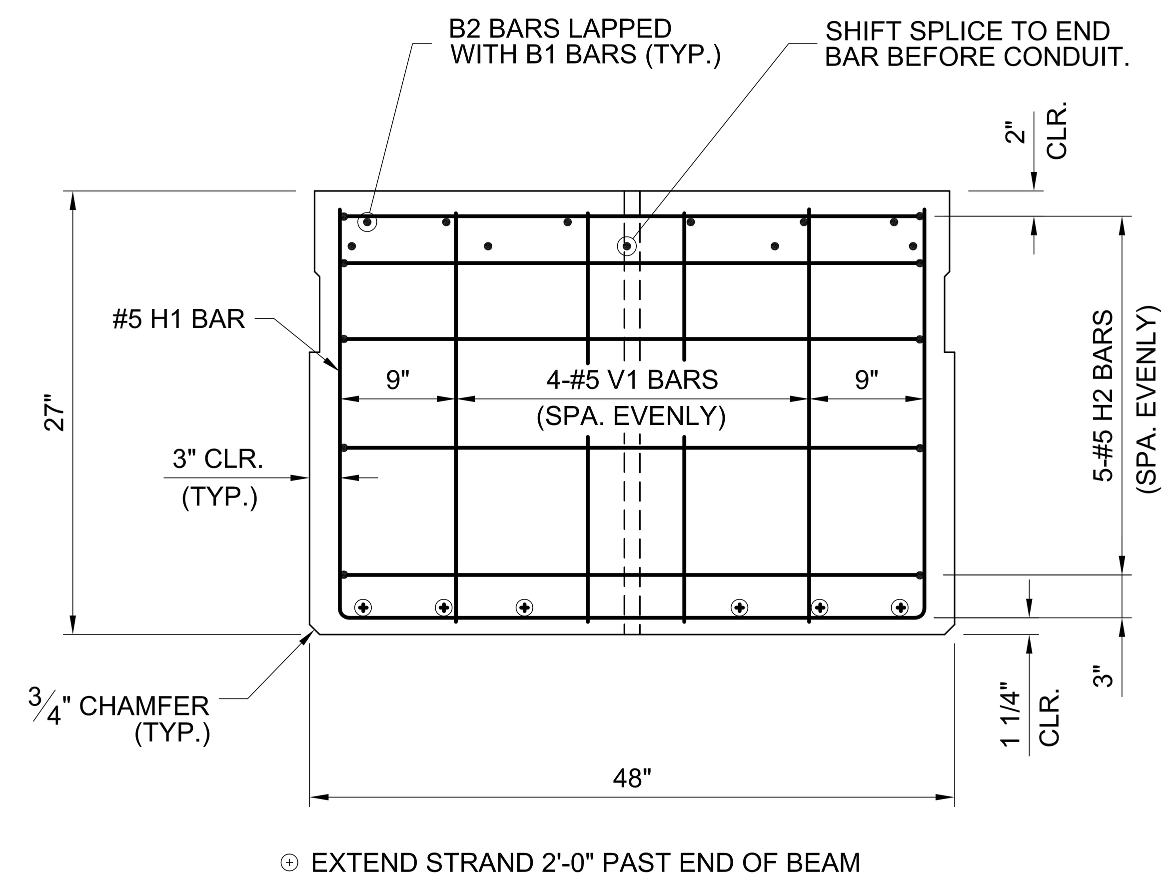
SUBJECT: CIVIL
BRIDGE CROSSINGS
LAS AGUILAS CREEK BOX BEAM

AREA
CLIENT DWG. NO.
DRAWING NO. D-000-C-0305
REV. A

PANOCHE CREEK BRIDGE



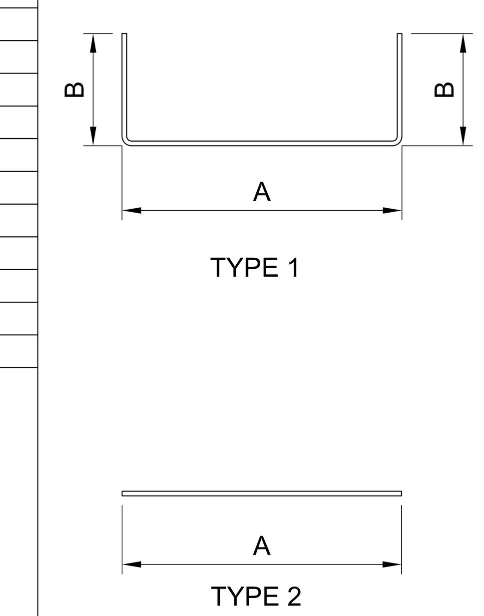
27X48 BOX BEAM



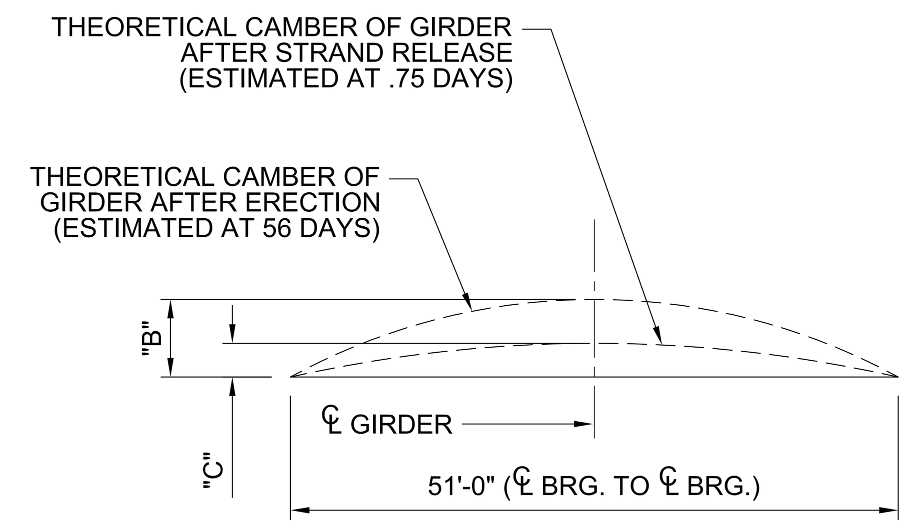
END VIEW OF BEAM

REINFORCING SCHEDULE

REINFORCING BARS								
SIZE	MARK	TYPE	A	B	C	D	E	BENDING DIAGRAMS
#4	R1	2	44"					
#4	S1	1	44"	21"				
#4	Y1	1	44"	20"				
#4	B1	2	30'-0"					
#4	B2	2	16'-0"					
#5	H1	1	42"	23"				
#5	H2	1	41"	18"				
#5	V1	2	23"					



FABRICATOR'S SHOP DRAWINGS SHALL SHOW COMPLETE DETAILS OF BEAM REINFORCING.



	"B"	"C"
INT. & EXT. GIRDER	$1\frac{3}{8}$"	$\frac{7}{8}$"

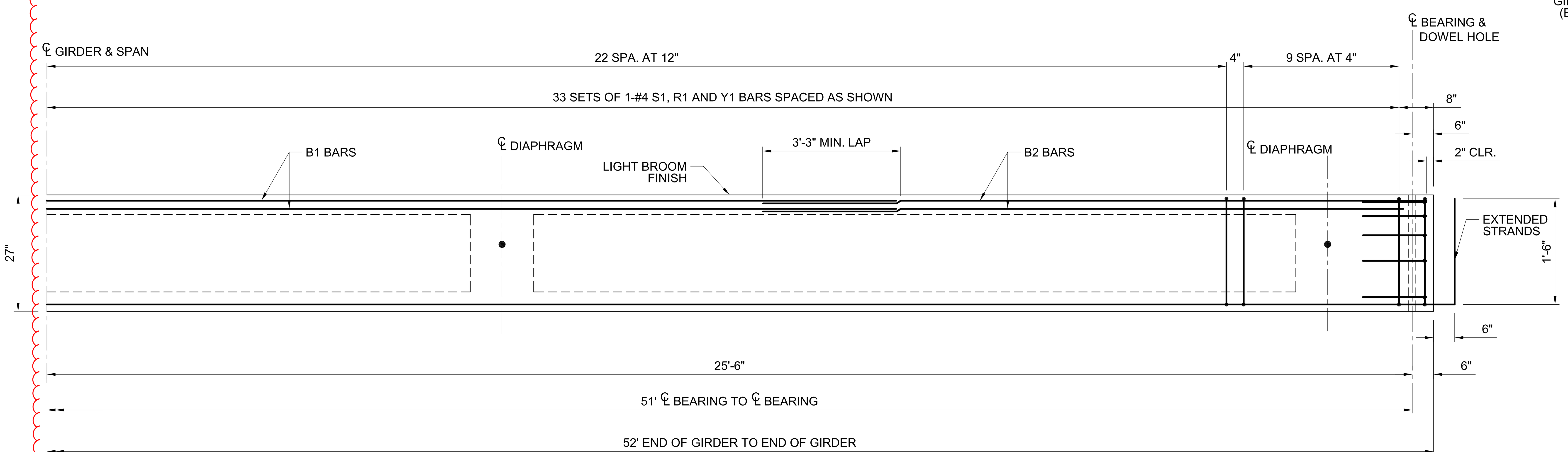
CONVERSION FACTOR FOR GIRDER CAMBER
0.25 PT. = 0.7125 X 0.5 PT.

GIRDER CAMBER DIAGRAM

ALLOWABLE CAMBER VARIATION FROM DESIGN CAMBER = +/- 1/2" MAX.

ALLOWABLE DIFFERENTIAL CAMBER BETWEEN ADJACENT MEMBERS OF THE SAME DESIGN = 1/2" MAX. (INCLUDES DIFFERENTIAL CAMBER FOR ADJACENT BEAMS)

The Panoche Creek bridge is no longer proposed.
REV.1 8-17-2015



ELEVATION

BOX BEAM GENERAL NOTES:

1) GIRDER IS SYMMETRICAL ABOUT CENTERLINE SPAN
2) SHIFT SHEAR BARS AS NEEDED TO CLEAR TRANSVERSE TIE ROD
3) COORDINATE BOX BEAM DETAILS WITH RAILING DETAILS FOR ADDITIONAL REQUIREMENTS OF EMBEDDED COMPONENTS.
4.) SHEAR KEY SHALL BE OMITTED AT EXTERIOR FACE OF EXTERIOR BEAMS.

WORK SAFELY

NOTES
1. NOT TO SCALE

KEYPLAN

REV	DDMMMYY	REVISION / ISSUE DESCRIPTION	DRN	CHK	APP	APP	APP	APP
A	24FEB15	ISSUED FOR PERMIT REVIEW	JLJ	JS	HRM			

REF	NUMBER	TITLE
		REFERENCES

STAMP/SEAL

APPROVED FOR PERMIT REVIEW

CLIENT PROJECT MGR.	DEPARTMENT MGR.	PROJECT MGR.
	TMB	HRM

PROJECT PHASE: PANOCHE VALLEY SOLAR PROJECT

PANOCHE VALLEY SOLAR LLC

amec

PROJECT NO.	ACTIVITY NO.		BY	DDMMMYY
176055		DES	RMK	02/2015
SCALE	PACKAGE CODE	DRN	JLJ	02/2015
NTS		CHK	JS	02/2015
		APP	HRM	02/2015

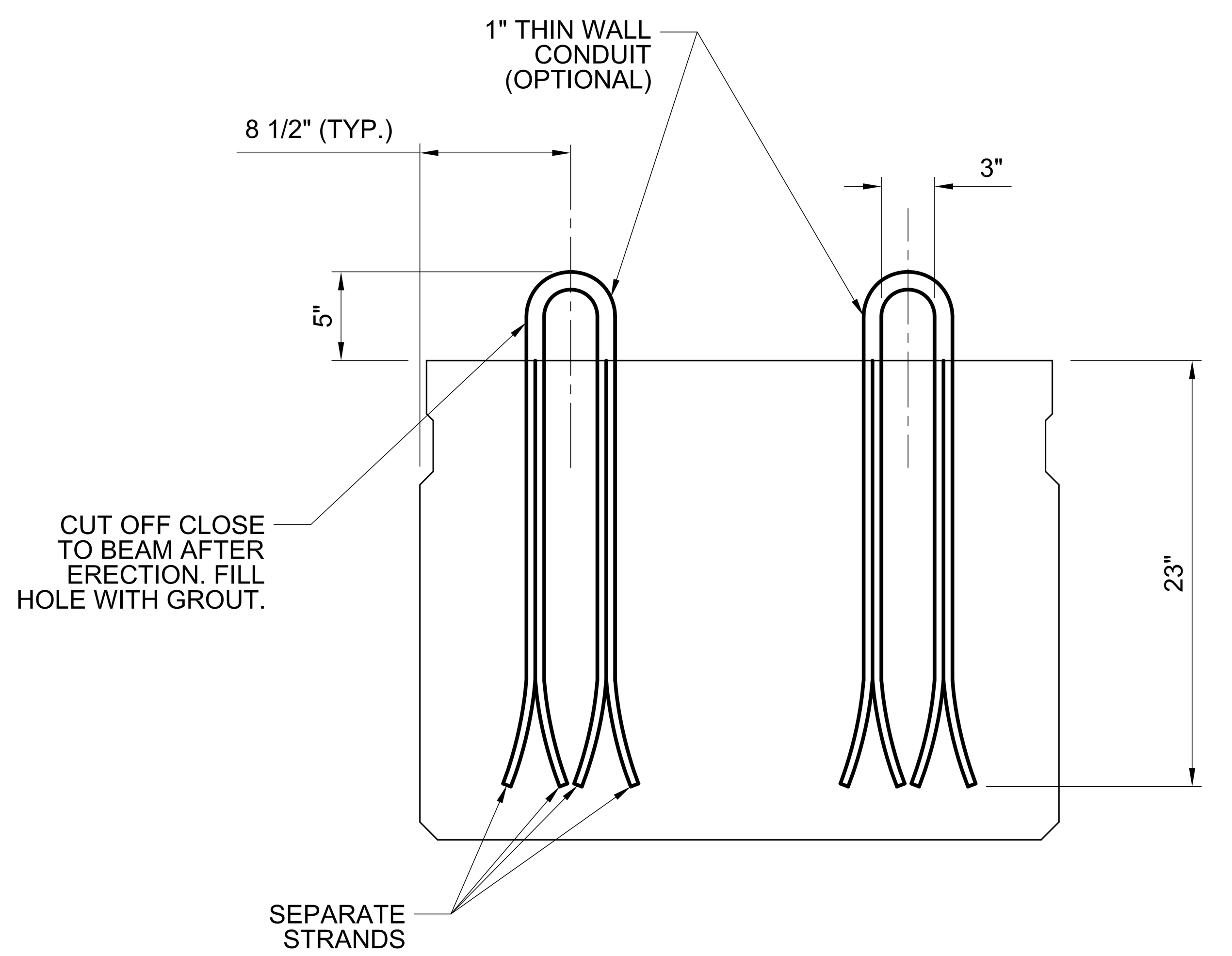
SUBJECT: CIVIL
BRIDGE CROSSINGS
PANOCHE CREEK BOX BEAM

AREA

CLIENT DWG. NO.

DRAWING NO. D-000-C-0306 REV. A

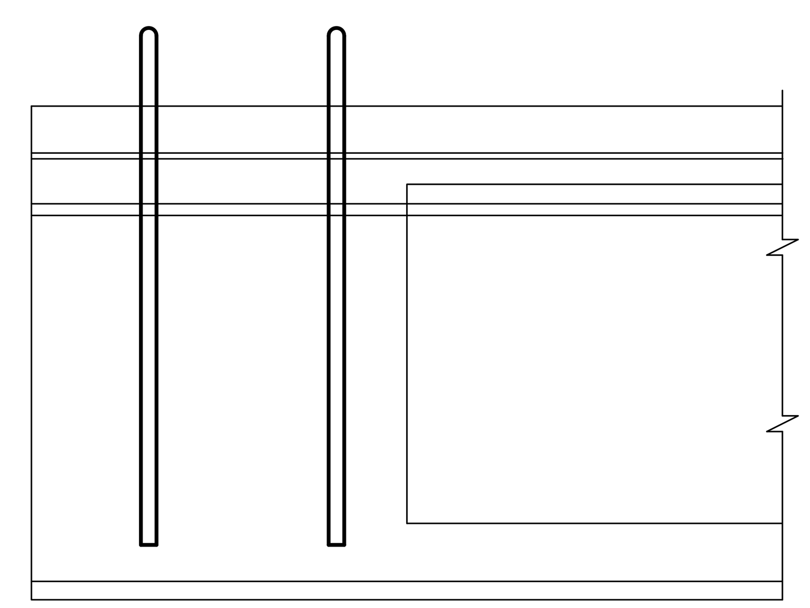
NOTES
1. NOT TO SCALE



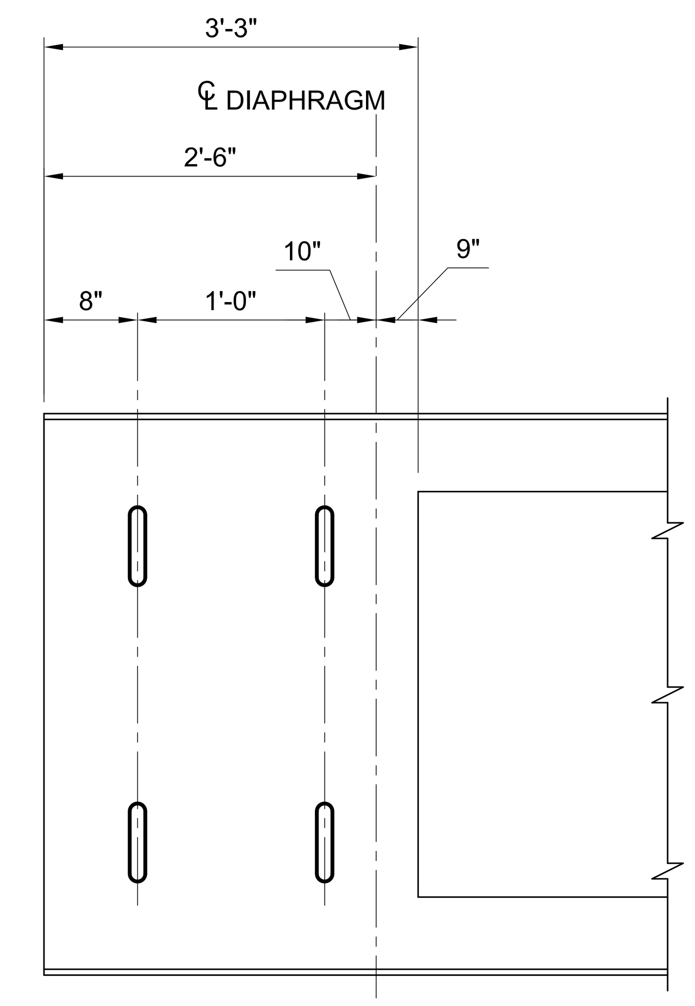
END VIEW

SHIFT LIFTING INSERTS SLIGHTLY WHERE NECESSARY TO CLEAR REINFORCEMENT, ANCHOR DOWEL HOLES OR TIE RODS

NOTE: ALL LIFTING INSERTS MUST BE UNIFORMLY ENGAGED DURING HANDLING.



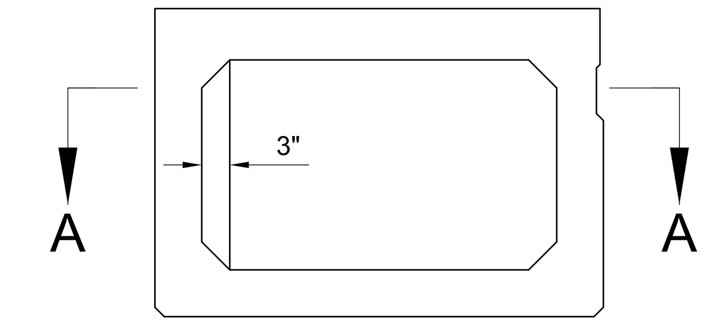
ELEVATION



PLAN

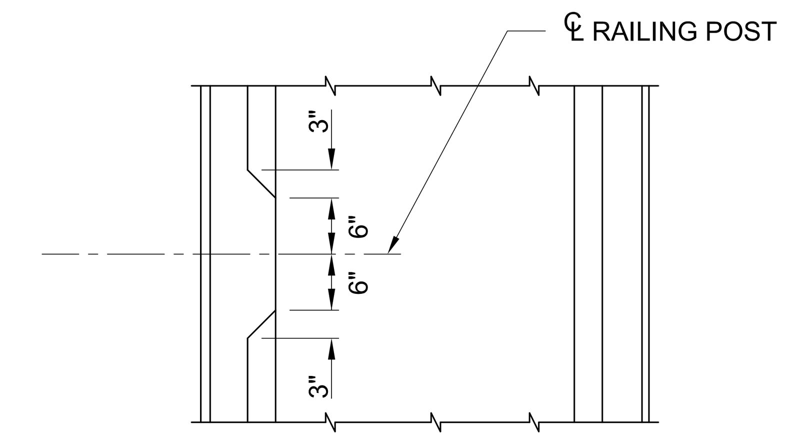
BEAM LIFTING INSERTS AT ABUTMENT

CONTRACTOR MAY PROPOSE AN ALTERNATE LIFT LUG SYSTEM TO BE APPROVED BY THE ENGINEER. SUBMIT COMPLETE DETAILS WITH BOX BEAM SHOP DRAWINGS.



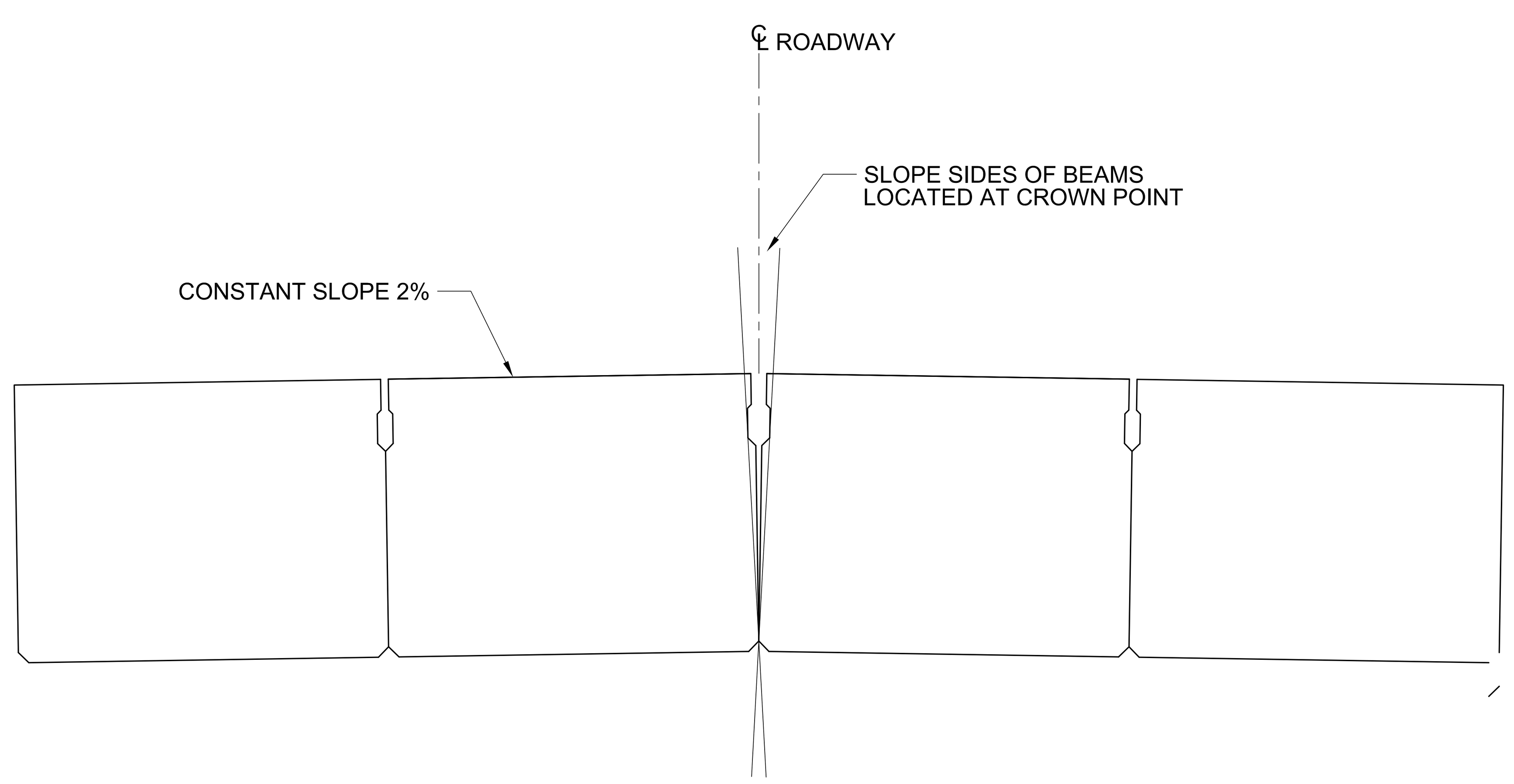
SECTION SHOWING WALL THICKENING AT RAILING ANCHORS

(REINFORCEMENT NOT SHOWN)

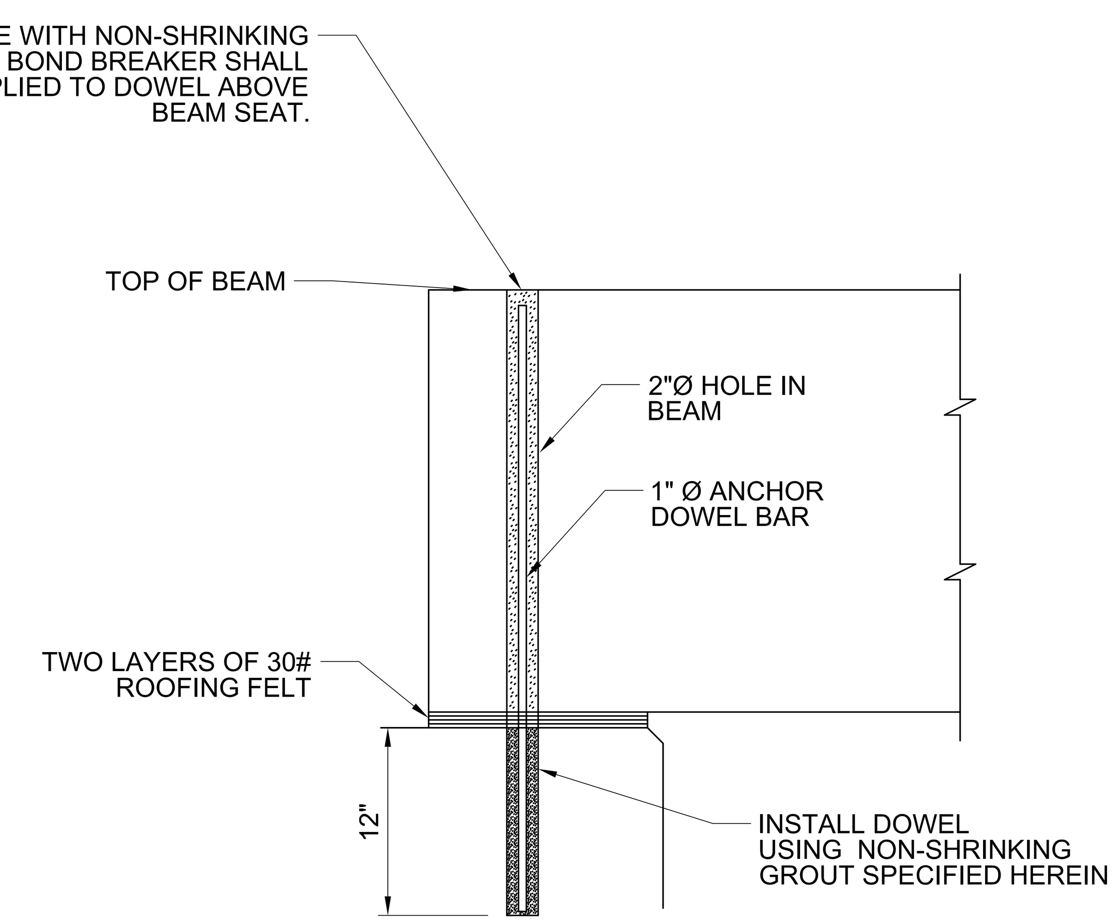


SECTION A-A

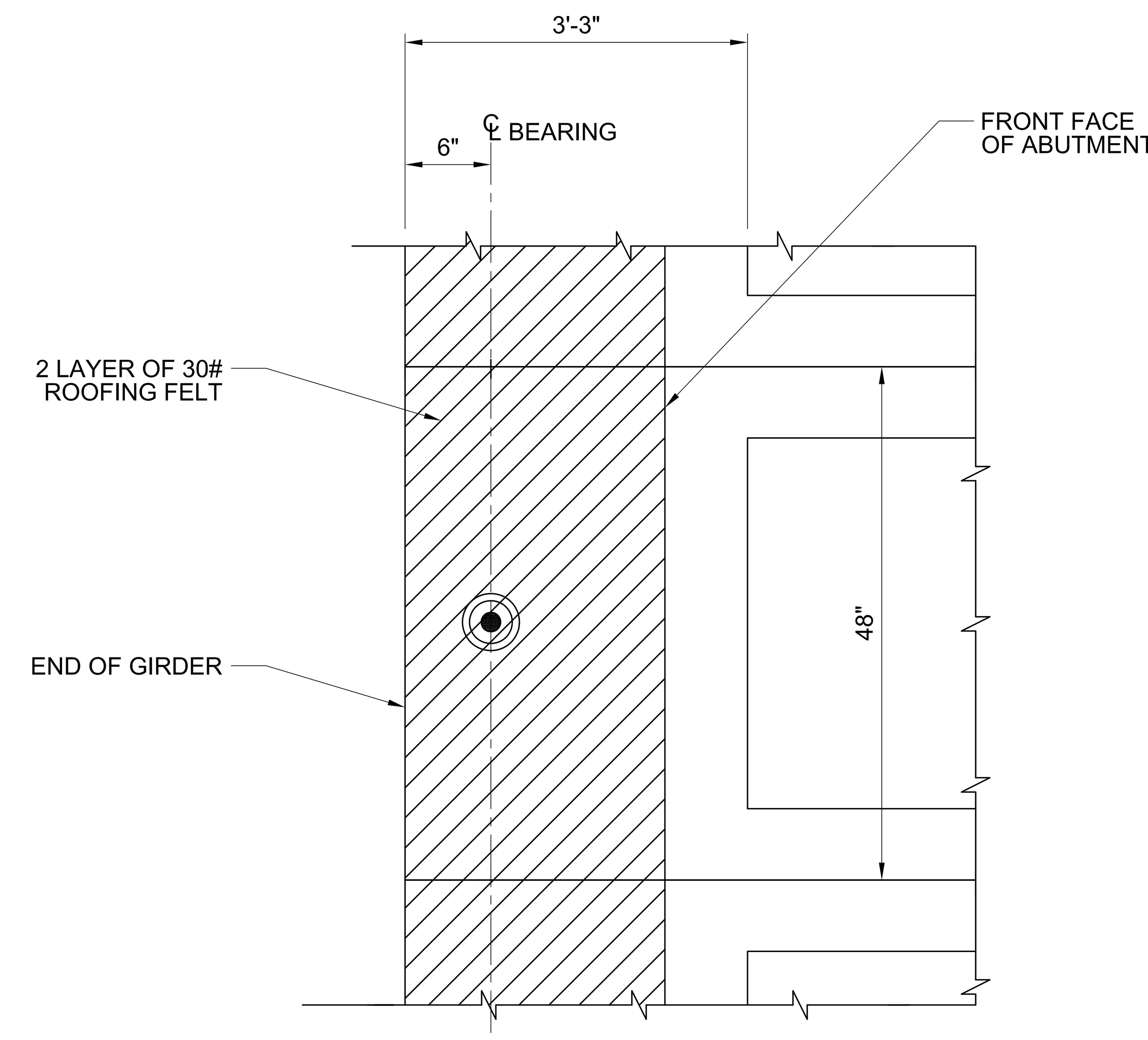
REFER TO RAILING SHEETS FOR ADDITIONAL RAILING DETAILS.



NORMAL CROWN TREATMENT AT ℄ ROADWAY



FIXED ANCHOR DOWELS



PLAN

WORK SAFELY

KEYPLAN

REV	DDMMMYY	REVISION / ISSUE DESCRIPTION	DRN	CHK	APP	APP	APP	APP
A	24FEB15	ISSUED FOR PERMIT REVIEW	JLJ	JS	HRM			

REF	NUMBER	TITLE

REFERENCES

STAMP/SEAL

APPROVED FOR PERMIT REVIEW

CLIENT PROJECT MGR.	DEPARTMENT MGR.	PROJECT MGR.
	TMB	HRM

PROJECT PHASE: PANOCHE VALLEY SOLAR PROJECT

PANOCHE VALLEY SOLAR LLC

amec

PROJECT NO.	ACTIVITY NO.		BY	DDMMMYY
176055		DES	RMK	02/2015
SCALE	PACKAGE CODE	DRN	JLJ	02/2015
NTS		CHK	JS	02/2015
		APP	HRM	02/2015

SUBJECT: CIVIL
BRIDGE CROSSINGS
BOX BEAM DETAILS

AREA

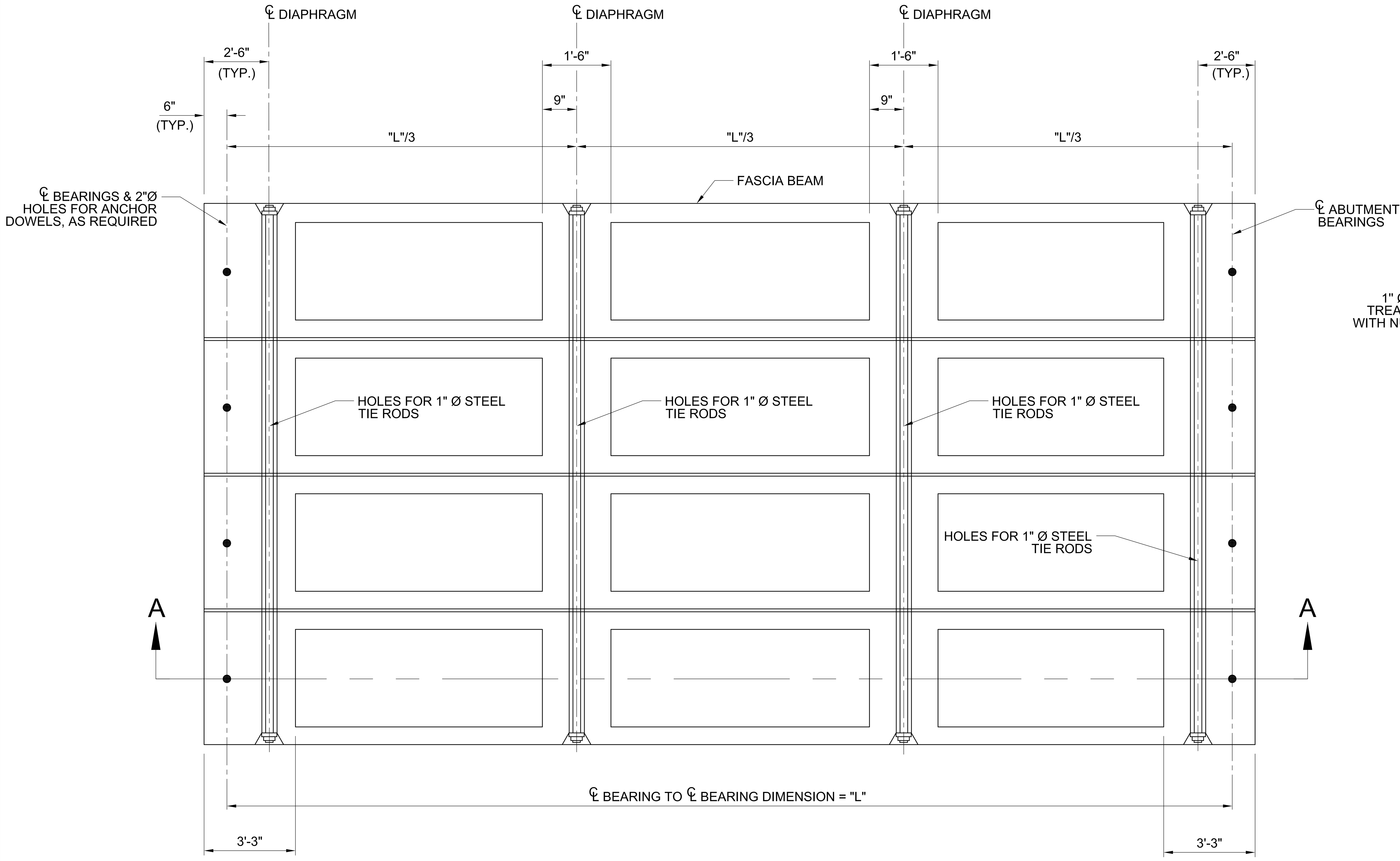
CLIENT DWG. NO.

DRAWING NO. D-000-C-0307 REV. A

CAD FILE: P:\STLOUIS\2015\325115001 - AMEC POWER - PANOCHE VALLEY BRIDGE\10-CAD\BOX BEAM DETAILS.DWG

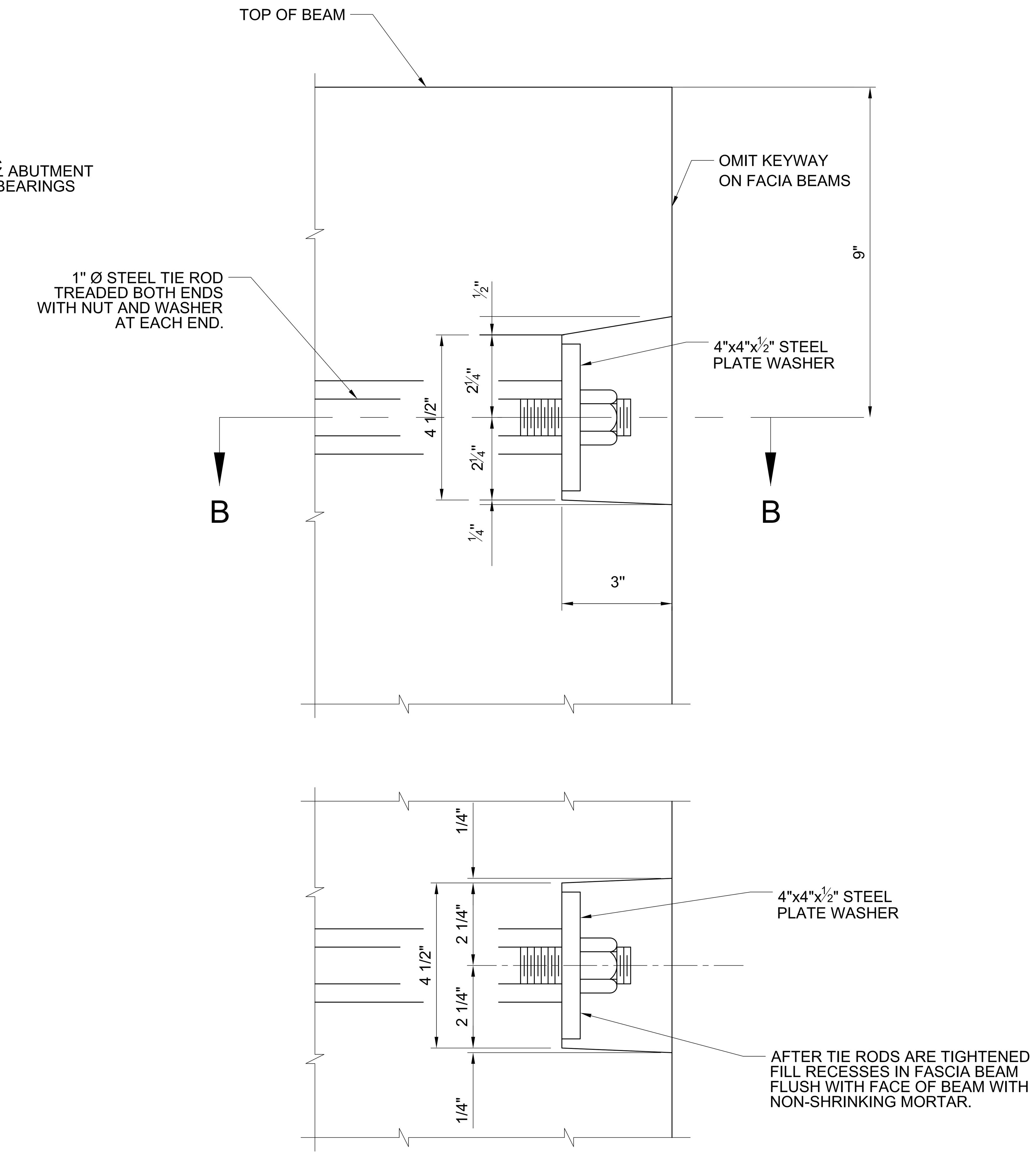
SAVED: 23-Feb-15 3:47 PM PLOTTED: 23-Feb-15 4:03 PM USER: JOHNSON, JEFFERY L.

NOTES
1. NOT TO SCALE



TYPICAL PLANS OF DIAPHRAGMS AND TRANSVERSE TIE RODS

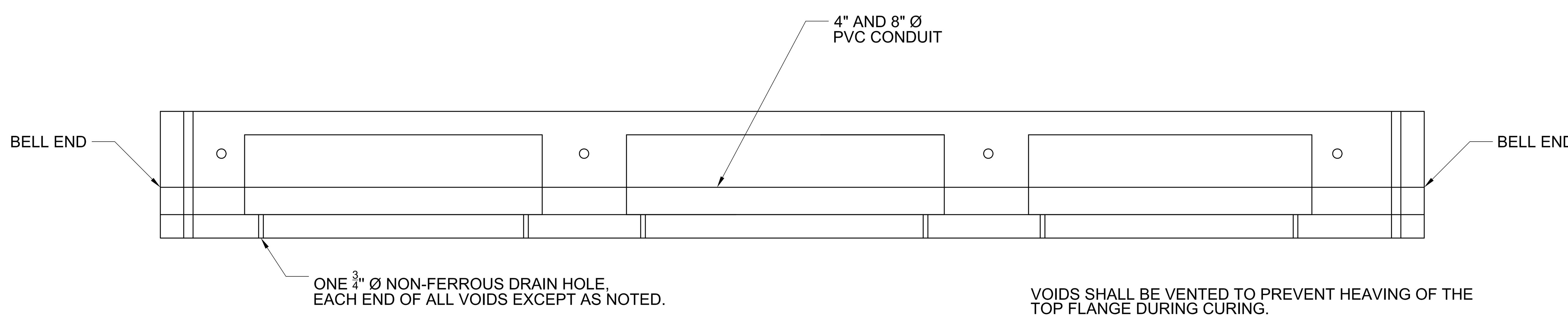
NOTE: OMIT KEYWAY ON OUTSIDE OF FASCIA BEAMS



SECTION B-B

NOTE:
HOLES IN BEAMS FOR TRANSVERSE TIE RODS SHALL BE NOT LESS THAN 2" O.C. AND NOT MORE THAN 3" O.C.

END DETAILS OF TRANSVERSE TIE ROD ANCHORAGE AT FACIA GIRDER



VOIDS SHALL BE VENTED TO PREVENT HEAVING OF THE TOP FLANGE DURING CURING.

CONDUIT ON LAS AGUILAS CREEK BRIDGE ONLY

SECTION A-A

WORK SAFELY

KEYPLAN

REV	DDMMMYY	REVISION / ISSUE DESCRIPTION	DRN	CHK	APP	APP	APP	APP
A	24FEB15	ISSUED FOR PERMIT REVIEW	JLJ	JS	HRM			

REF	NUMBER	TITLE
		REFERENCES

STAMP/SEAL

APPROVED FOR PERMIT REVIEW

CLIENT PROJECT MGR.	DEPARTMENT MGR.	PROJECT MGR.
	TMB	HRM

PANOCHE VALLEY SOLAR LLC

amec

PROJECT PHASE: PANOCHE VALLEY SOLAR PROJECT

PROJECT NO.	ACTIVITY NO.		BY	DDMMMYY
176055		DES	RMK	02/2015
SCALE	PACKAGE CODE	DRN	JLJ	02/2015
NTS		CHK	JS	02/2015
		APP	HRM	02/2015

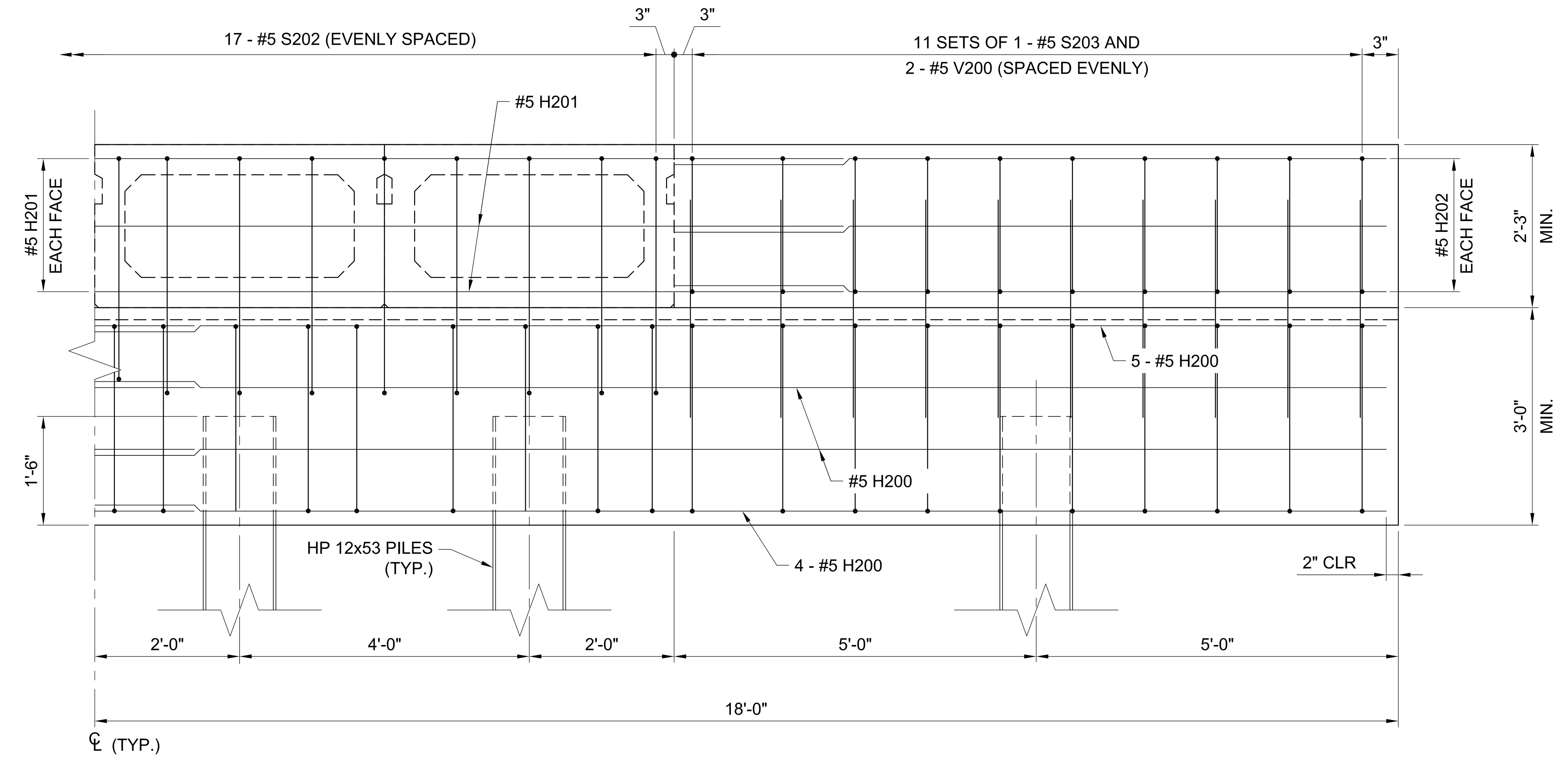
SUBJECT: CIVIL
BRIDGE CROSSINGS
BOX BEAM DIAPHRAGM

AREA

CLIENT DWG. NO.

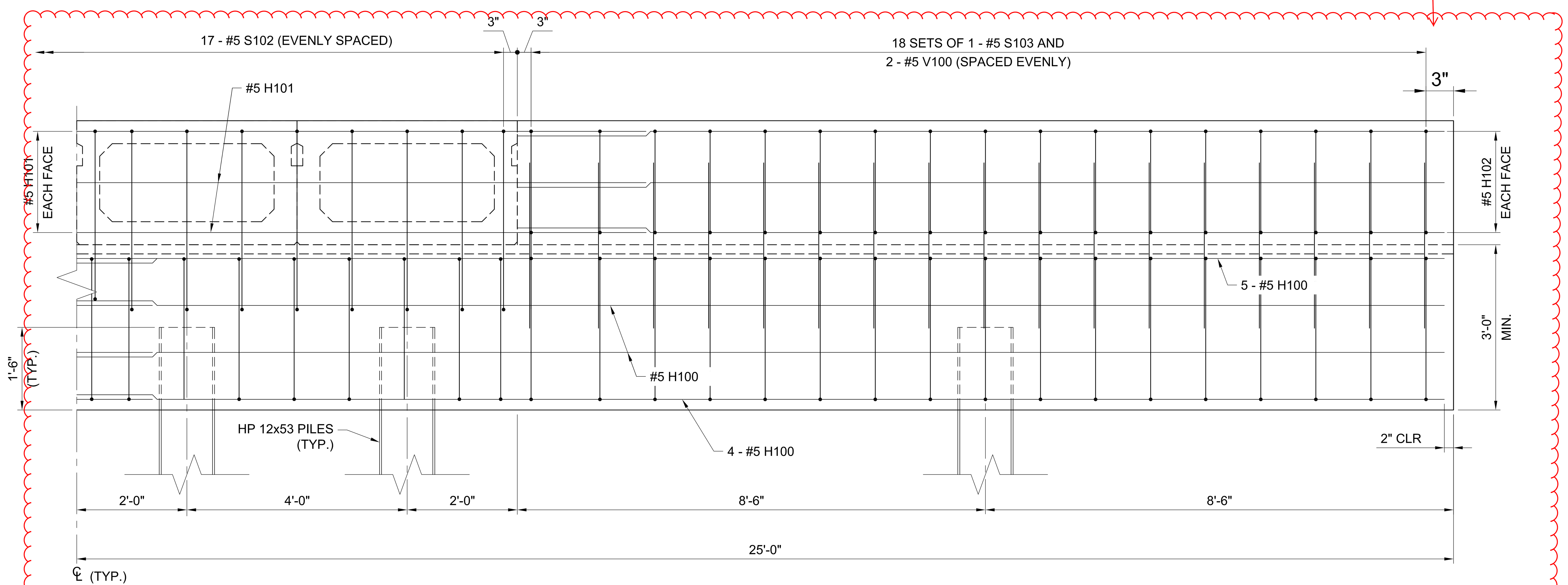
DRAWING NO. D-000-C-0308 REV. A

NOTES
1. NOT TO SCALE

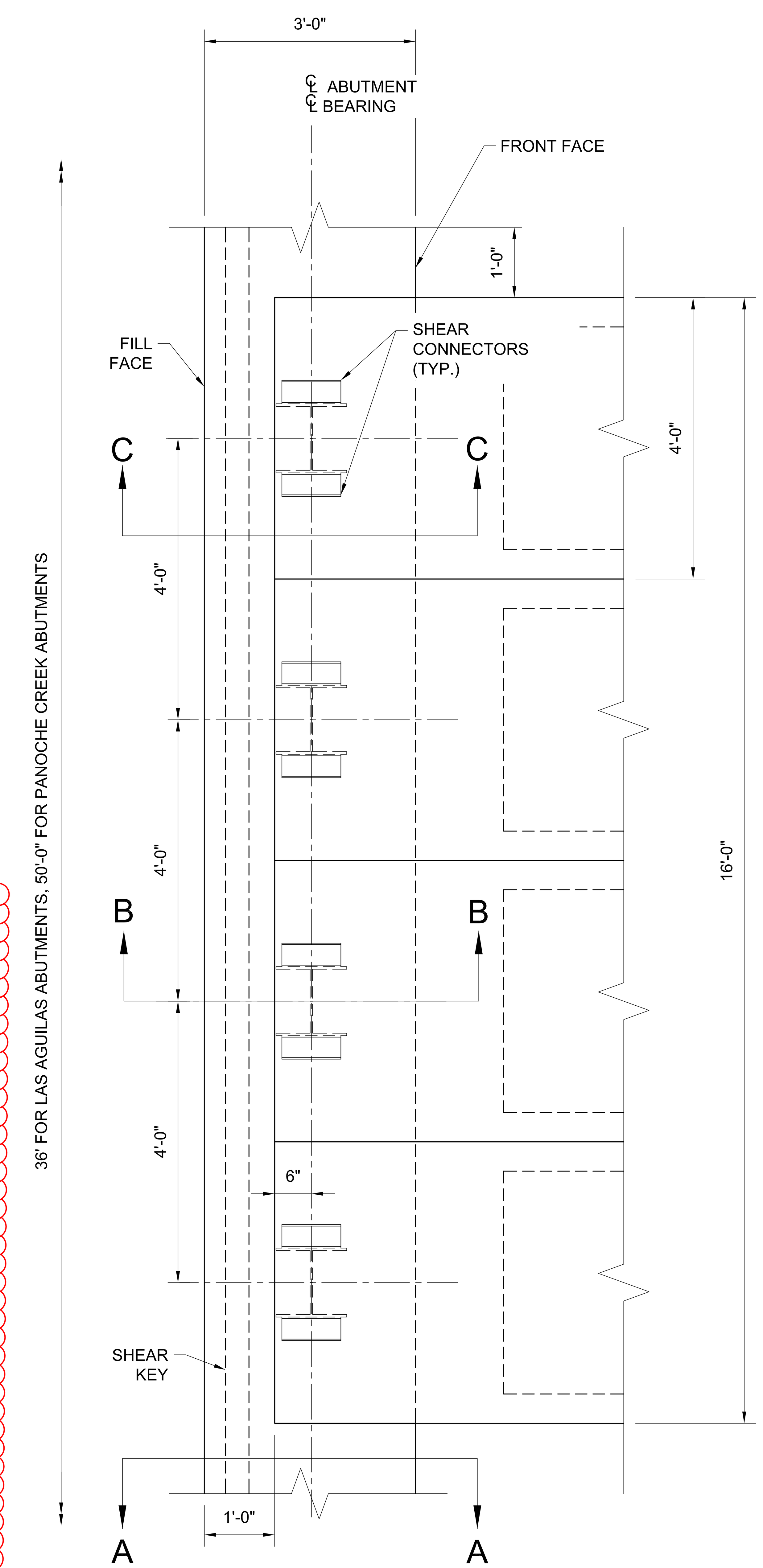


HALF SECTION LAS AGUILAS CREEK ABUTMENTS
(SYMMETRICAL ABOUT CENTERLINE)
(LOOKING AT FILL FACE)

The Panoche Creek bridge is no longer proposed.
REV.1 8-17-2015



HALF SECTION PANOCHE CREEK ABUTMENTS
~~(SYMMETRICAL ABOUT CENTERLINE)~~
(LOOKING AT FILL FACE)



TYPICAL PARTIAL ABUTMENT PLAN

WORK SAFELY

KEYPLAN

REV	DDMMMYY	REVISION / ISSUE DESCRIPTION	DRN	CHK	APP	APP	APP	APP
A	24FEB15	ISSUED FOR PERMIT REVIEW	JLJ	JS	HRM			

REF	NUMBER	TITLE

REFERENCES

STAMP/SEAL

APPROVED FOR PERMIT REVIEW

CLIENT PROJECT MGR.	DEPARTMENT MGR.	PROJECT MGR.
	TMB	HRM

PROJECT PHASE: PANOCHE VALLEY SOLAR PROJECT

PANOCHE VALLEY SOLAR LLC

amec

PROJECT NO.	ACTIVITY NO.		BY	DDMMMYY
176055		DES	RMK	02/2015
SCALE	PACKAGE CODE	DRN	JLJ	02/2015
NTS		CHK	JS	02/2015
		APP	HRM	02/2015

SUBJECT: CIVIL
BRIDGE CROSSINGS
ABUTMENT DETAILS 1

AREA

CLIENT DWG. NO.

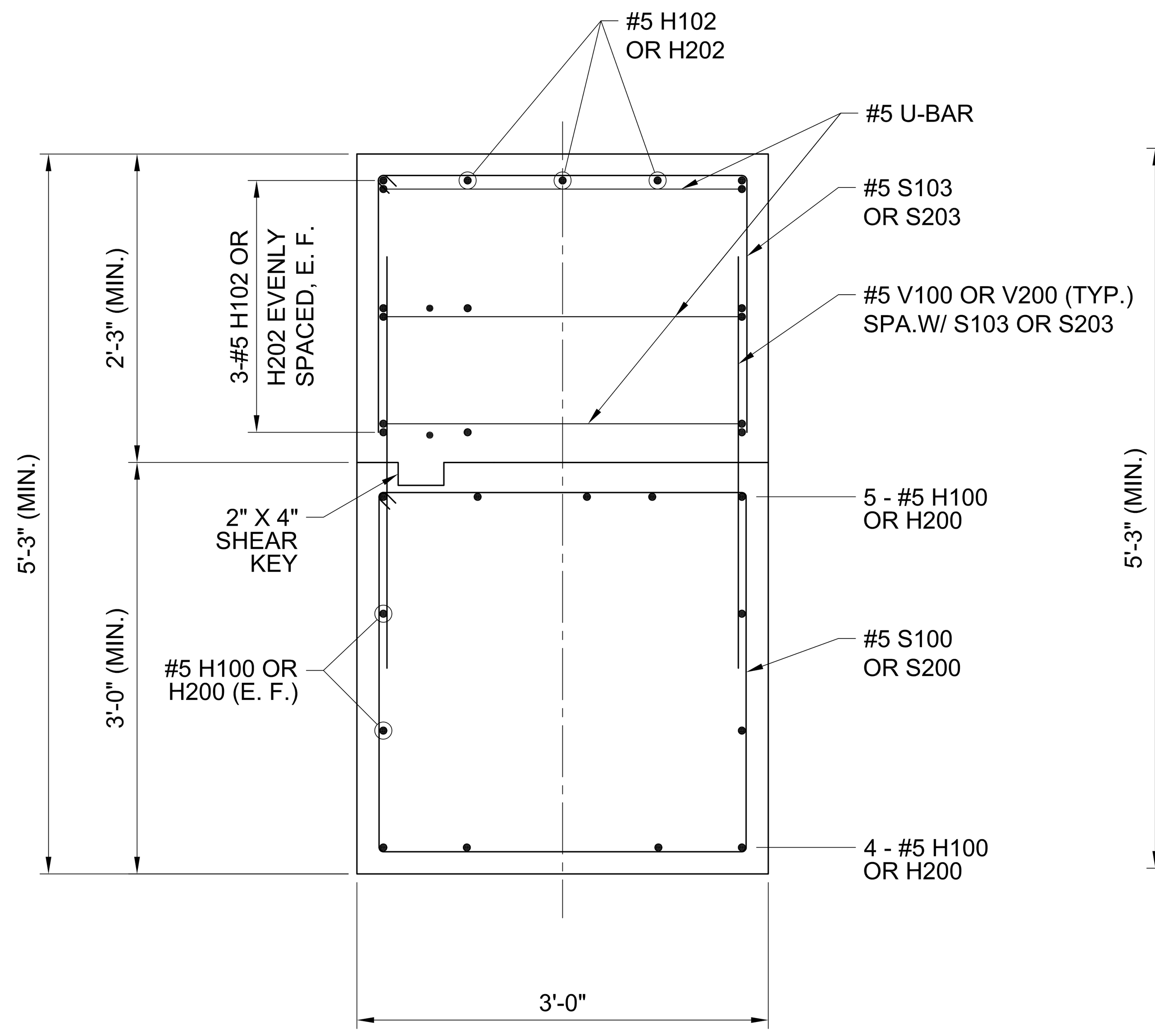
DRAWING NO. D-000-C-0309 REV. A

SAVED: 23-Feb-15 3:54 PM PLOTTED: 23-Feb-15 4:03 PM USER: JOHNSON, JEFFERY L.

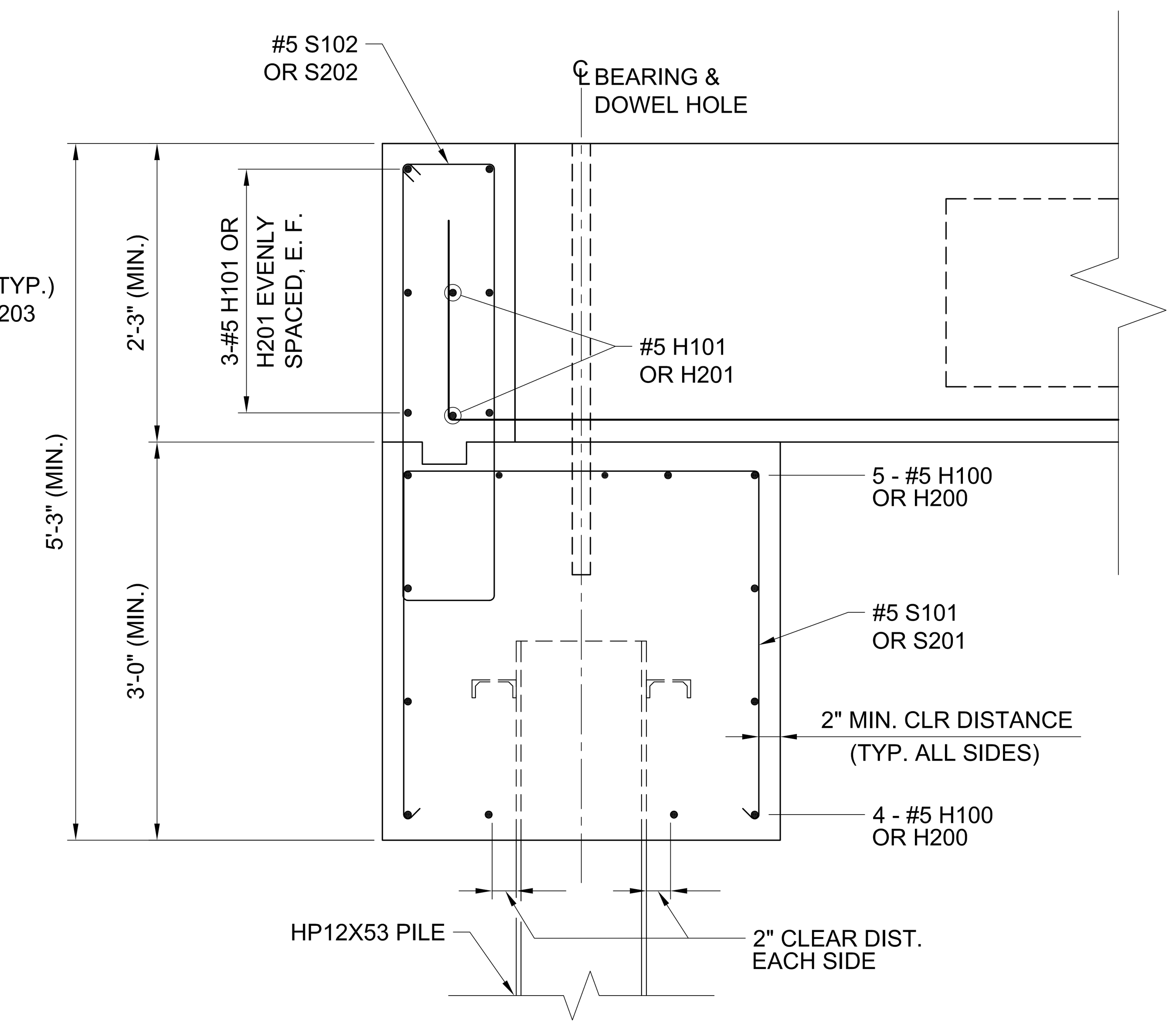
CAD FILE: P:\STLOUIS\2015\325115001 - AMEC POWER - PANOCHE VALLEY BRIDGE\10-CAD\ABUTMENTS.DWG

ARCH D-24x36

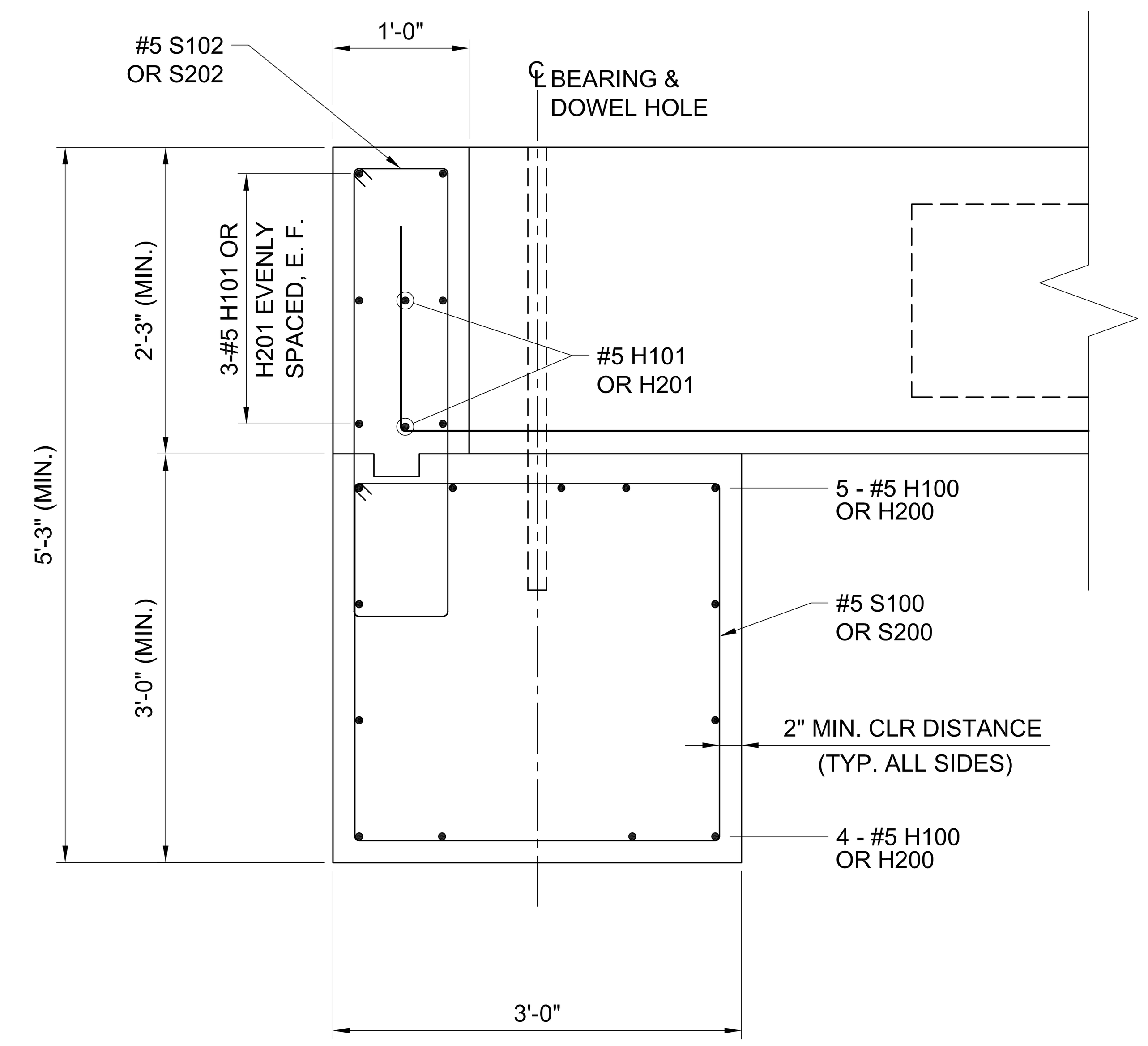
NOTES
1. NOT TO SCALE



SECTION A-A



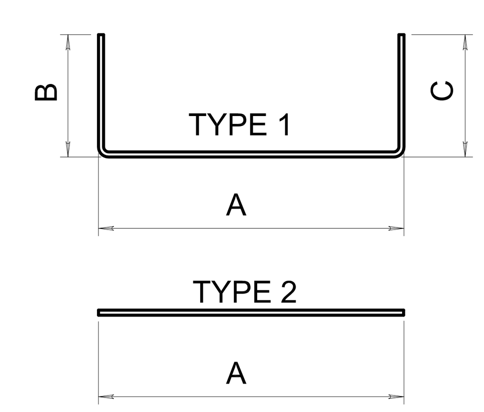
SECTION B-B



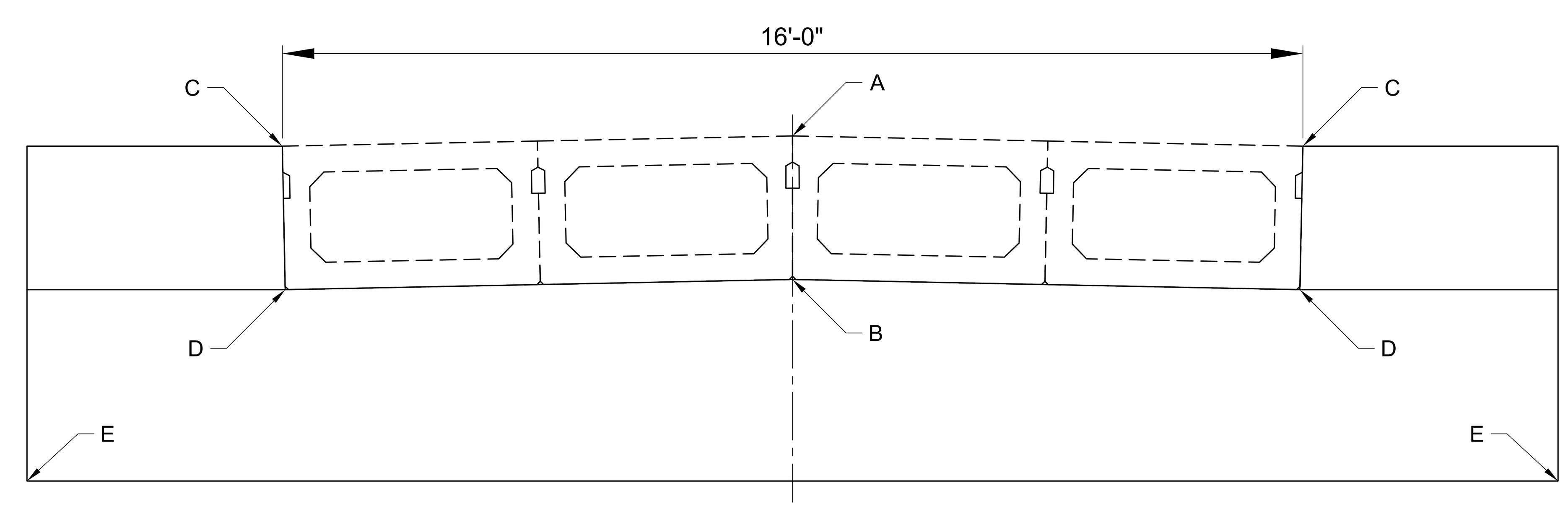
SECTION C-C

SUMMARY OF QUANTITIES

REINFORCING BARS											
NUM.	SIZE	MARK	TYPE	A	B	C	D	E	LGTH	WHT.	BENDING DIAGRAMS



ABUTMENT ELEVATIONS



FILL FACE						
LOCATION	A	B	C	D	E	STA
LOS AGULAS (DS)	1420.3	1418.03	1420.14	1417.89	1414.79	167+19
LOST AGULAS (US)	1418.13	1415.88	1417.97	1415.72	1412.72	167+75
PANOCHE	1353.5	1351.25	1353.34	1351.09	1348.09	1+73 & 2+27
NOTE: ELEVATIONS AT FILL FACE ARE FIXED						

FRONT FACE						
LOCATION	A	B	C	D	E	STA
LOS AGULAS (DS)		1417.95		1417.79	1414.77	167+22
LOST AGULAS (US)		1416.02		1415.86	1412.72	167+72
PANOCHE		1351.27		1351.11	1348.09	1+76 & 2+24
NOTE: ELEVATIONS AT FRONT FACE MAY HAVE TO BE ADJUSTED FOR CAMBER SLOPE						

WORK SAFELY

KEYPLAN

REV	DDMMMYY	REVISION / ISSUE DESCRIPTION	DRN	CHK	APP	APP	APP	APP
A	24FEB15	ISSUED FOR PERMIT REVIEW	JLJ	JS	HRM			

REF	NUMBER	TITLE
	REFERENCES	

STAMP/SEAL

APPROVED FOR PERMIT REVIEW

CLIENT PROJECT MGR.	DEPARTMENT MGR.	PROJECT MGR.
	TMB	HRM

PROJECT PHASE: PANOCHE VALLEY SOLAR PROJECT

PANOCHE VALLEY SOLAR LLC

amec

PROJECT NO.	ACTIVITY NO.		BY	DDMMMYY
176055		DES	RMK	02/2015
SCALE	PACKAGE CODE	DRN	JLJ	02/2015
NTS		CHK	JS	02/2015
		APP	HRM	02/2015

SUBJECT: CIVIL
BRIDGE CROSSINGS
ABUTMENT DETAILS 2

AREA

CLIENT DWG. NO.

DRAWING NO. D-000-C-0310 REV. A

ARCH D-24x36

NOTES FOR GUARDRAIL SYSTEM

APPLICATION:
THIS RAILING SYSTEM HAS BEEN ACCEPTED TO THE TL-4 CRITERIA OF NCHRP REPORT 350.
A BRIDGE TERMINAL ASSEMBLY IS NOT PROVIDED AND FLARED ENDS ARE NOT CRASHWORTHHY.

DESIGN DATA:
REINFORCING STEEL - MINIMUM YIELD STRENGTH = 60,000 PSI
STEEL TUBING - MINIMUM YIELD STRENGTH = 46,000 PSI
ALL OTHER STEEL - MINIMUM YIELD STRENGTH = 50,000 PSI

MATERIALS:
FURNISH SHAPED STRUCTURAL TUBING ACCORDING ASTM A500, GRADE B.
FURNISH STRUCTURAL STEEL SHAPES, PLATES AND PLATE WASHERS ACCORDING TO ASTM GRADE 36 (A36)

GALVANIZING:
GALVANIZE ALL SHAPED STRUCTURAL TUBES, POSTS, PLATES, HARDWARE AND ACCESSORIES IN ACCORDANCE WITH ASTM A123. PRIOR TO GALVANIZING, ROUND ALL STRUCTURAL TUBING ENDS AND REMOVE BURRS FROM ALL STEEL TUBING, SHAPES AND PLATES.

TUBE SPLICES:
LOCATE SPLICES SO THAT EACH TUBE SEGMENT IS CONNECTED TO NOT LESS THAN TWO POSTS. STAGGER SPLICES IN THE TOP AND BOTTOM TUBES TO AVOID OCCURRENCES IN THE SAME PANEL.

FASTENERS:
FURNISH MATERIAL CONFORMING TO THE FOLLOWING:

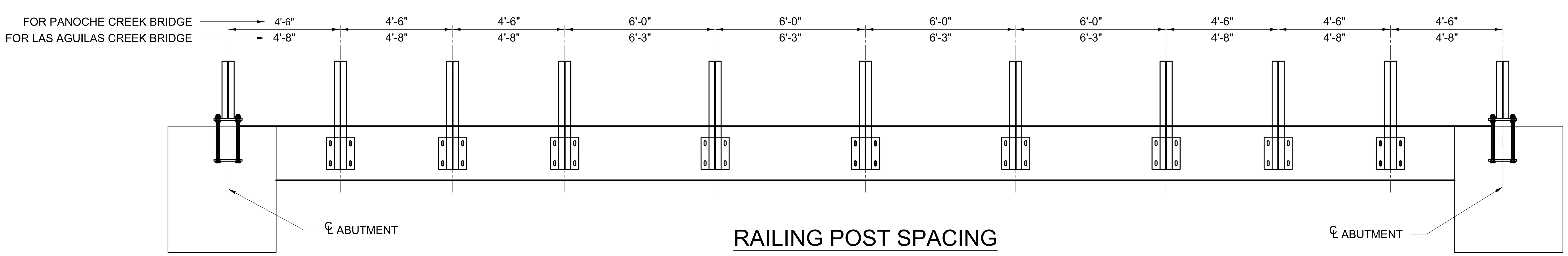
ALL ANCHOR BOLTS, SLEEVE NUTS, NUTS AND WASHERS SHALL CONFORM TO ASTM A 449.

END WELDED STUDS SHALL CONFORM TO ASTM A108.

THE TUBE RAIL TO POST CONNECTION BOLTS AND HEX NUTS SHALL CONFORM TO ASTM A307.

THE HEX CAP SCREWS (BOLTS), HEX NUTS AND WASHERS SHALL CONFORM TO ASTM A 449.

NOTES
1. NOT TO SCALE



RAILING POST SPACING

KEYPLAN

WORK SAFELY

REV	DDMMMYY	REVISION / ISSUE DESCRIPTION	DRN	CHK	APP	APP	APP	APP
A	24FEB15	ISSUED FOR PERMIT REVIEW	JLJ	JS	HRM			

REF	NUMBER	TITLE
REFERENCES		

STAMP/SEAL

APPROVED FOR PERMIT REVIEW

CLIENT PROJECT MGR.	DEPARTMENT MGR.	PROJECT MGR.
	TMB	HRM

PROJECT PHASE: PANOCHE VALLEY SOLAR PROJECT

PANOCHE VALLEY SOLAR LLC

amec

PROJECT NO.	ACTIVITY NO.		BY	DDMMMYY
176055		DES	RMK	02/2015
SCALE	PACKAGE CODE	DRN	JLJ	02/2015
NTS		CHK	JS	02/2015
		APP	HRM	02/2015

SUBJECT: CIVIL
BRIDGE CROSSINGS
GUARDRAIL SYSTEM GENERAL NOTES

AREA

CLIENT DWG. NO.

DRAWING NO. D-000-C-0311 REV. A

SAVED: 23-Feb-15 3:59 PM PLOTTED: 23-Feb-15 4:03 PM USER: JOHNSON, JEFFERY L.

CAD FILE: P:\STLOUIS\2015\325115001 - AMEC POWER - PANOCHE VALLEY BRIDGE\10-CAD\GUARDRAIL DETAIL 1.DWG

ARCH D-24x36

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CLIENT PROJECT MGR.	DEPARTMENT MGR.	PROJECT MGR.
	TMB	HRM

PROJECT PHASE: PANOCHE VALLEY SOLAR PROJECT

PANOCHE VALLEY SOLAR LLC

amec

PROJECT NO.	ACTIVITY NO.		BY	DDMMMYY
176055		DES	RMK	02/2015
SCALE	PACKAGE CODE	DRN	JLJ	02/2015
NTS		CHK	JS	02/2015
		APP	HRM	02/2015

SUBJECT: CIVIL
BRIDGE CROSSINGS
GUARDRAIL SYSTEM DETAILS 1

AREA
CLIENT DWG. NO.
DRAWING NO. C-000-D-0312
REV. A

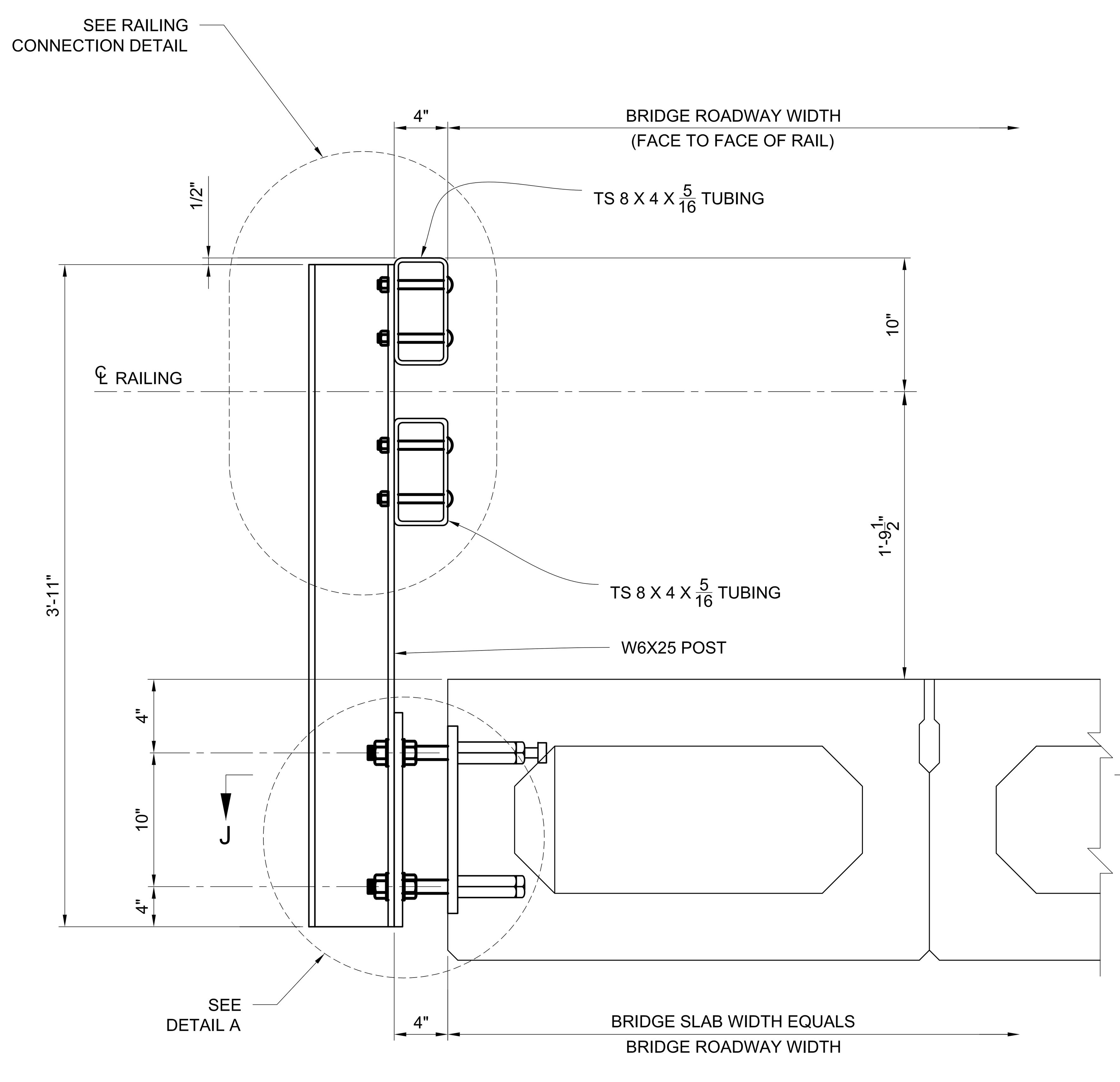
REV	DDMMMYY	REVISION / ISSUE DESCRIPTION	DRN	CHK	APP	APP	APP	APP
A	24FEB15	ISSUED FOR PERMIT REVIEW	JLJ	JS	HRM			

REF	NUMBER	TITLE

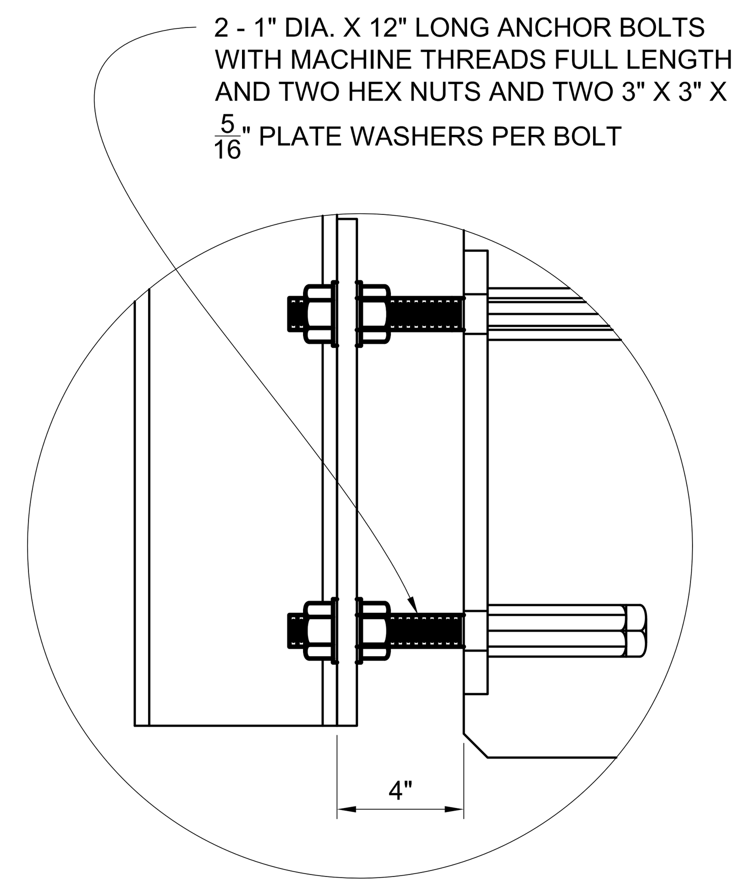
REFERENCES

SAVED: 23-Feb-15 4:01 PM PLOTTED: 23-Feb-15 4:03 PM USER: JOHNSON, JEFFERY L.

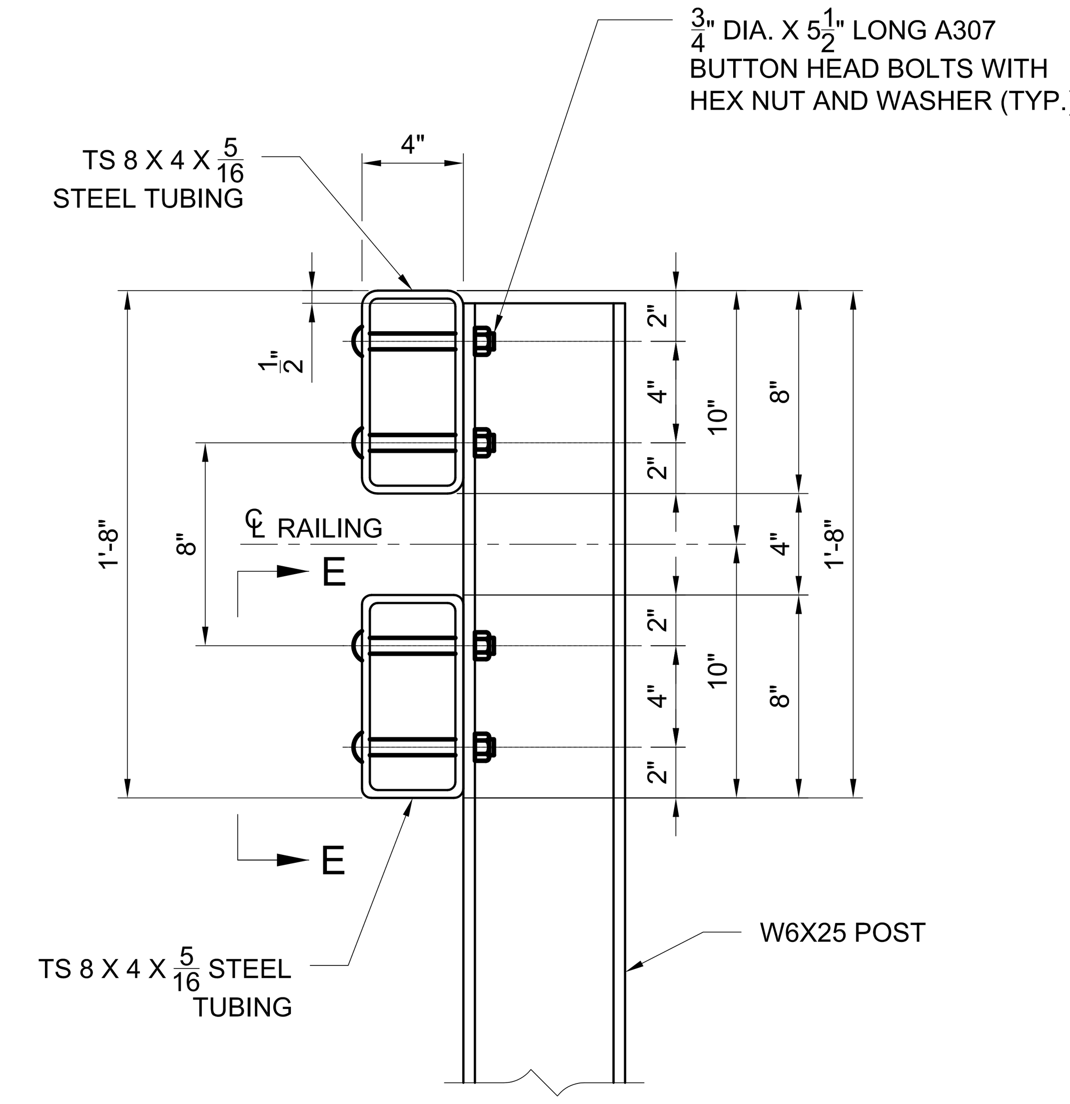
NOTES
NOT TO SCALE



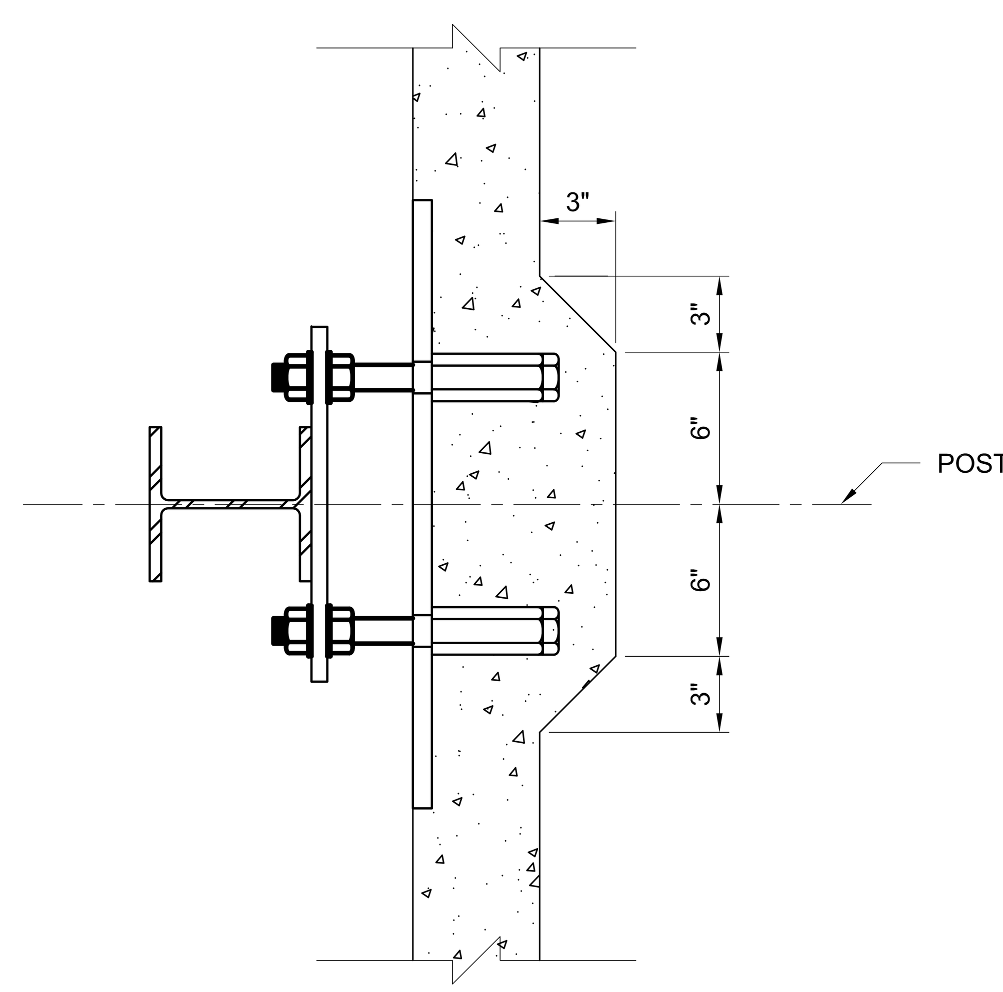
SECTION A-A



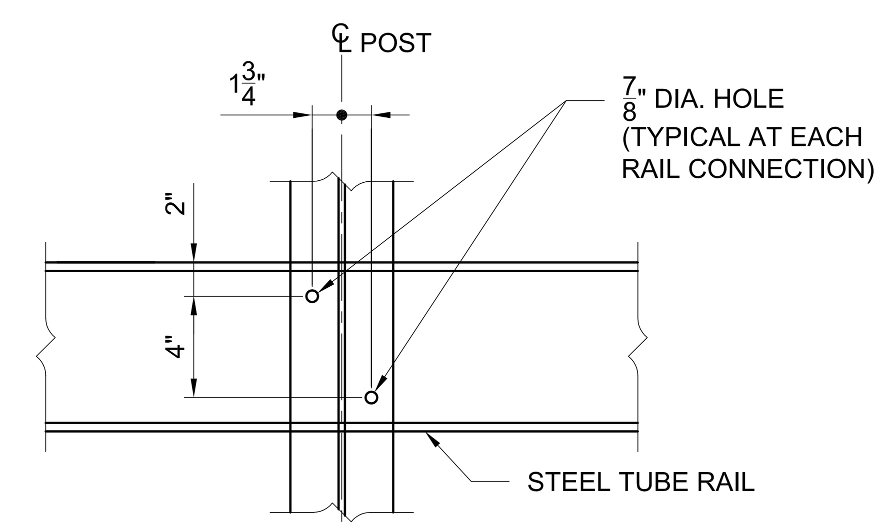
DETAIL A



RAILING CONNECTION DETAIL



SECTION J-J



VIEW E-E

KEYPLAN

WORK SAFELY

REV	DDMMMYY	REVISION / ISSUE DESCRIPTION	DRN	CHK	APP	APP	APP	APP
A	24FEB15	ISSUED FOR PERMIT REVIEW	JLJ	JS	HRM			

REF	NUMBER	TITLE

REFERENCES

STAMP/SEAL

APPROVED FOR PERMIT REVIEW

CLIENT PROJECT MGR.	DEPARTMENT MGR.	PROJECT MGR.
	TMB	HRM

PROJECT PHASE: PANOCHE VALLEY SOLAR PROJECT

PANOCHE VALLEY SOLAR LLC

PROJECT NO.	ACTIVITY NO.		BY	DDMMMYY
176055		DES	RMK	02/2015
SCALE	PACKAGE CODE	DRN	JLJ	02/2015
NTS		CHK	JS	02/2015
		APP	HRM	02/2015

SUBJECT: CIVIL
BRIDGE CROSSINGS
GUARDRAIL SYSTEM DETAILS 2

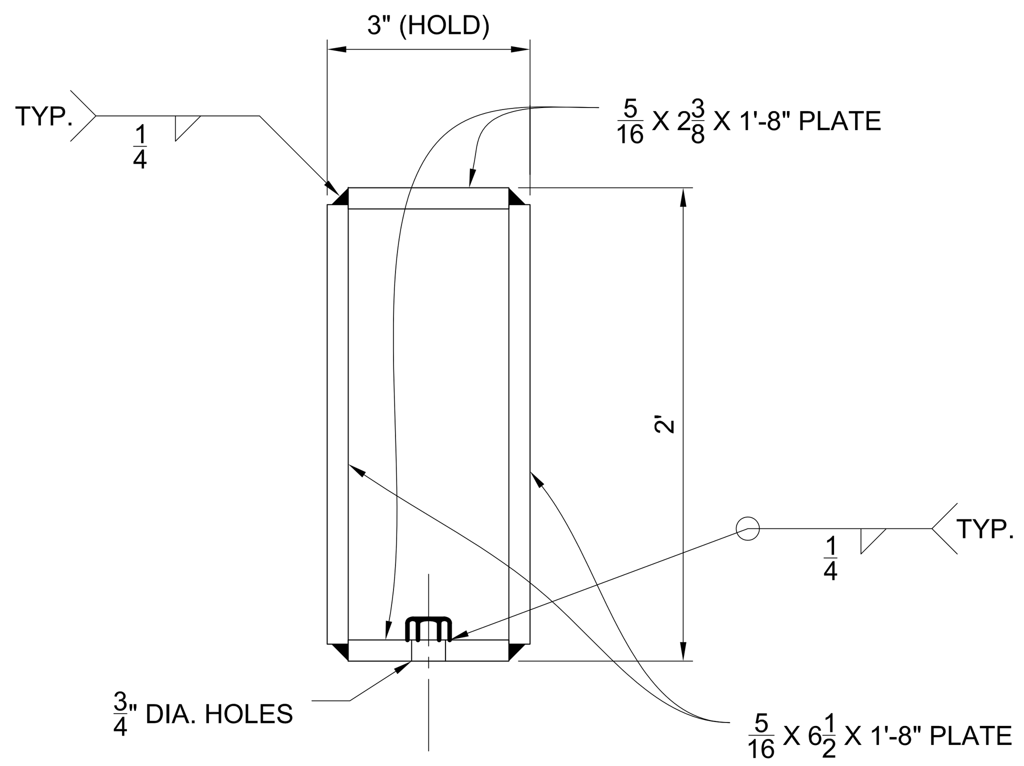
AREA
CLIENT DWG. NO.
DRAWING NO. D-000-C-0313
REV. A

SAVED: 23-Feb-15 3:59 PM PLOTTED: 23-Feb-15 4:03 PM USER: JOHNSON, JEFFERY L.

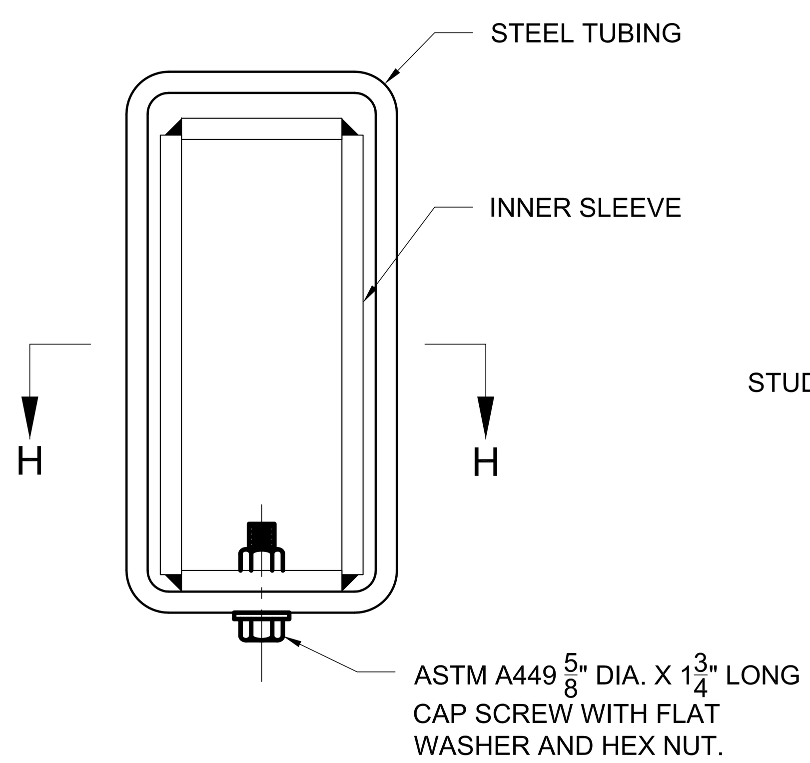
CAD FILE: P:\STLOUIS\2015\325115001 - AMEC POWER - PANOCHE VALLEY BRIDGE\10-CAD\GUARDRAIL DETAIL 1.DWG

ARCH D-24x36

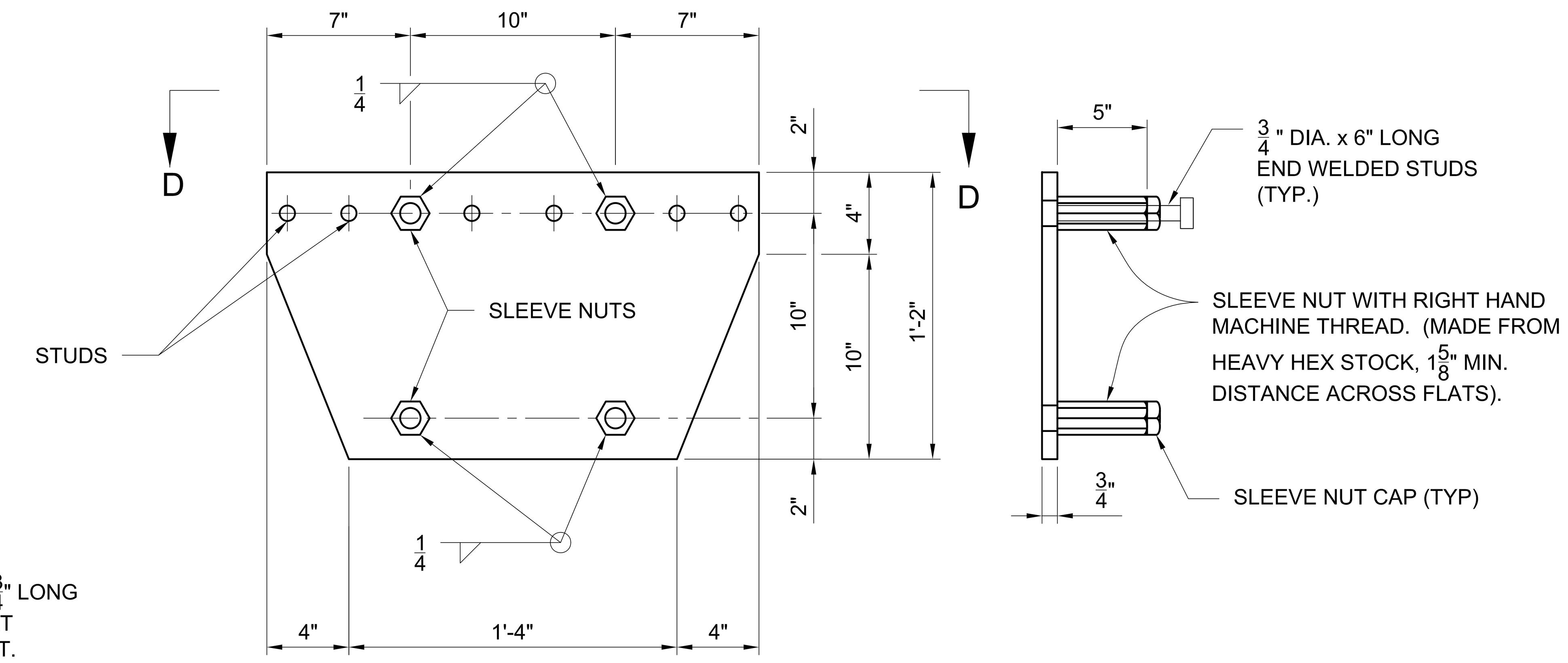
NOT TO SCALE



FINISHED DIMENSIONS OF INNER SLEEVE



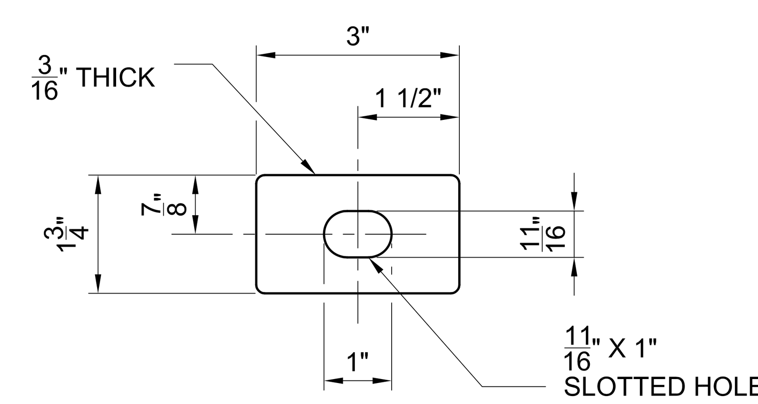
SECTION THRU SPLICE



ELEVATION

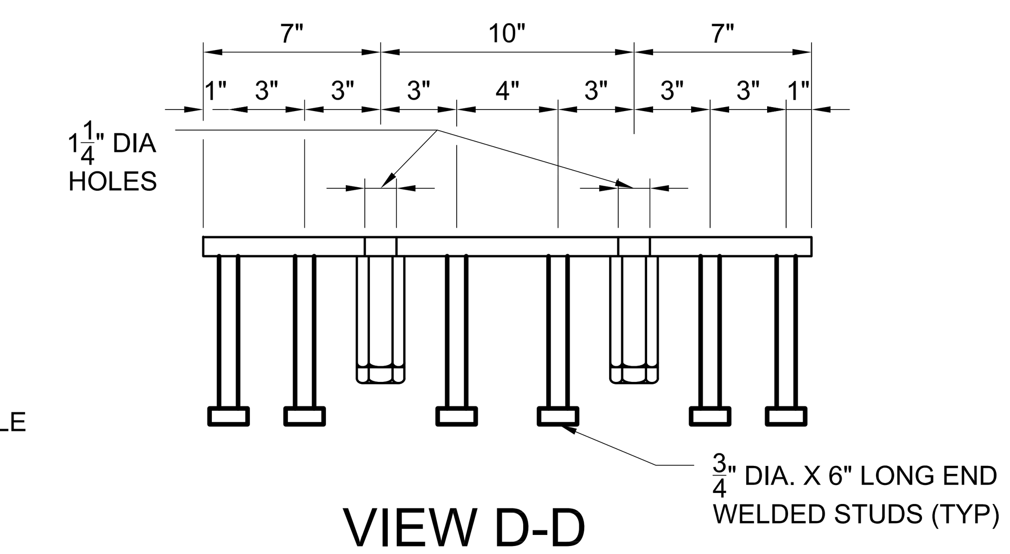
END VIEW

POST ANCHOR DEVICE

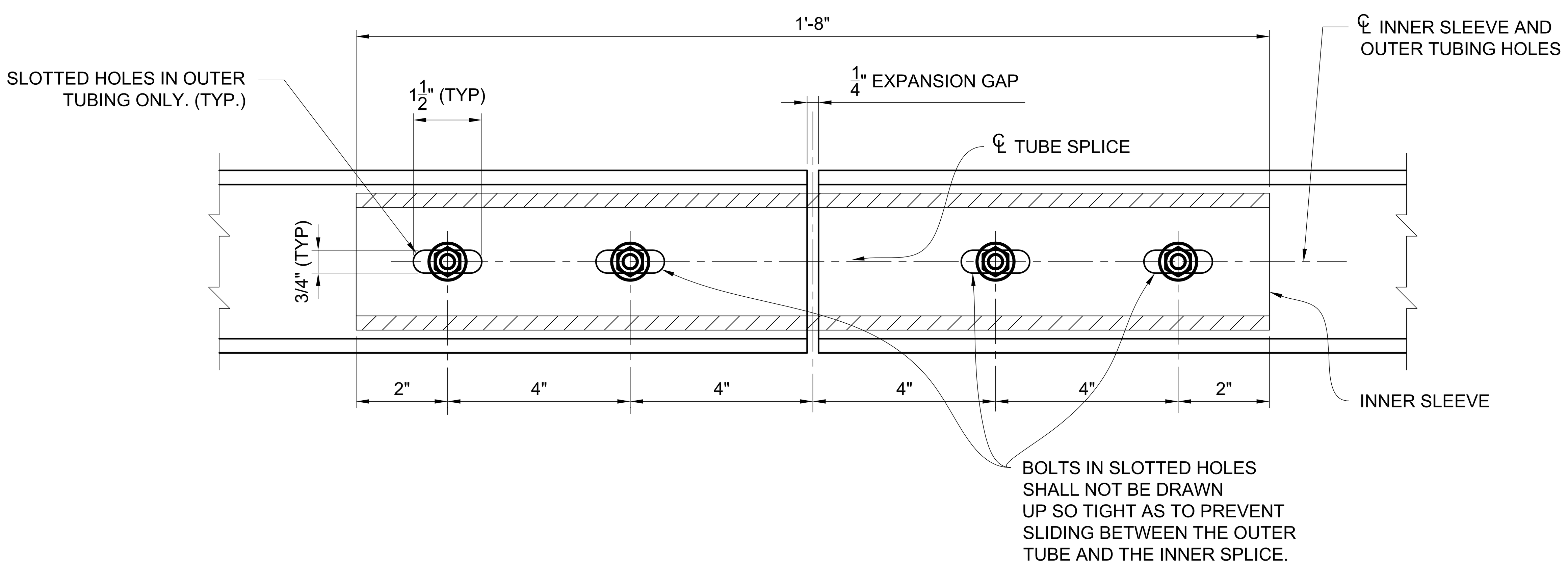


SPECIAL WASHER

PLACE WASHER BETWEEN BOLT HEAD AND FACE OF THRIE BEAM RAIL.

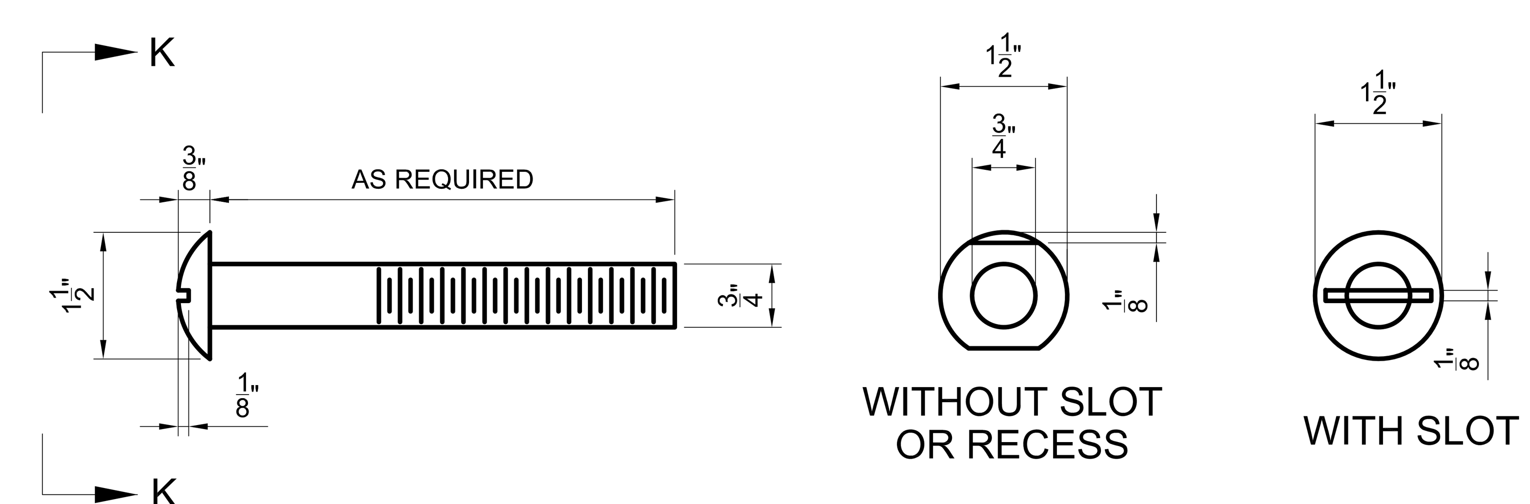


VIEW D-D



SECTION H-H

STEEL TUBE SPLICE DETAILS



VIEW K-K

DETAIL OF 3/4" DIA. BUTTON HEAD BOLT

WORK SAFELY

KEYPLAN

REV	DDMMMYY	REVISION / ISSUE DESCRIPTION	DRN	CHK	APP	APP	APP	APP
A	24FEB15	ISSUED FOR PERMIT REVIEW	JLJ	JS	HRM			

REF	NUMBER	TITLE
		REFERENCES

STAMP/SEAL

APPROVED FOR PERMIT REVIEW

CLIENT PROJECT MGR.	DEPARTMENT MGR.	PROJECT MGR.
	TMB	HRM

PROJECT PHASE: PANOCHE VALLEY SOLAR PROJECT

PROJECT NO.	ACTIVITY NO.		BY	DDMMMYY
176055		DES	RMK	02/2015
SCALE	PACKAGE CODE	DRN	JLJ	02/2015
NTS		CHK	JS	02/2015
		APP	HRM	02/2015

PANOCHE VALLEY SOLAR LLC

SUBJECT: CIVIL
BRIDGE CROSSINGS
GUARDRAIL SYSTEM DETAILS 3

amec

AREA

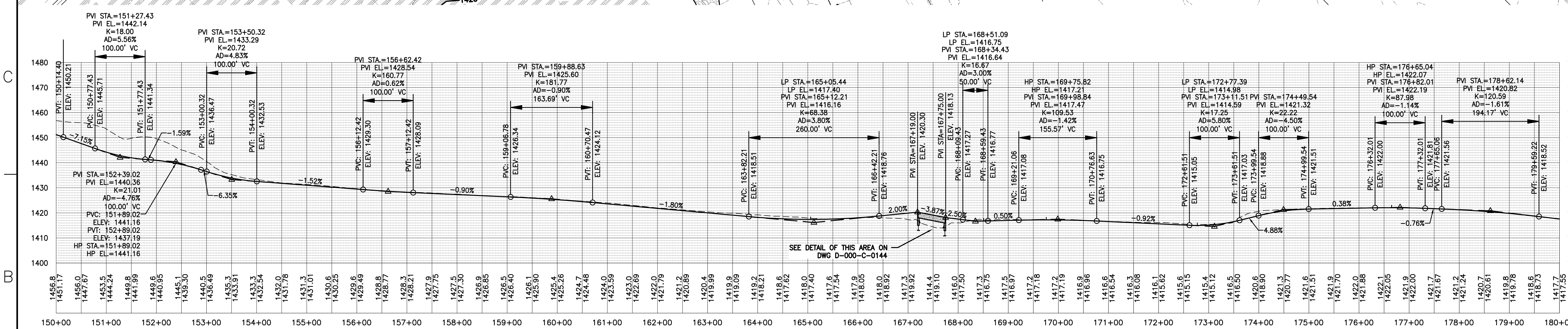
CLIENT DWG. NO.

DRAWING NO. D-000-C-0314 REV. A

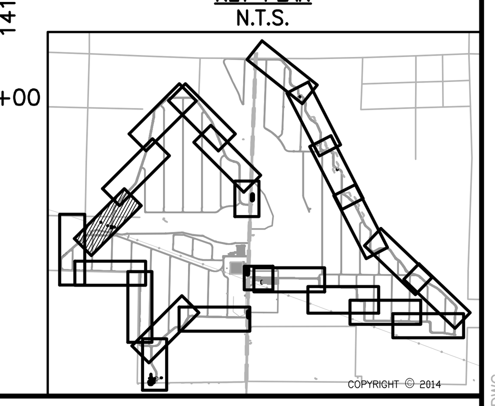
ARCH D-24x36

CAD FILE: P:\STLOUIS\2015\325115001 - AMEC POWER - PANOCHE VALLEY BRIDGE\10-CAD\GUARDRAIL DETAIL 1.DWG

SAVED: 23-Feb-15 3:59 PM PLOTTED: 23-Feb-15 4:04 PM USER: JOHNSON, JEFFERY L.



KEY PLAN
N.T.S.



IMPROVEMENT PLANS APPROVED:
SAN BENITO COUNTY DEPT OF PUBLIC WORKS

COUNTY ENGINEER DATE
(ARMAN NAZEMI C.E. 55927)

NOTES:
1. FOR TYPICAL ROAD SECTION AND DETAILS, SEE DRAWING D-000-C-0084.
2. FOR LINE AND CURVE GEOMETRY TABLES, SEE DRAWING D-000-C-0133.
3. FOR LOW WATER CROSSING TYPICAL DETAILS, SEE DRAWING D-000-C-0171.
4. FOR OPEN CHANNEL TYPICAL DETAILS, SEE DRAWING D-000-C-0152.
5. FOR SEDIMENT AND EROSION CONTROL NOTES AND DETAILS, SEE DRAWING D-000-C-0071 TO 0074.
6. FOR GENERAL DETAILS, SEE DRAWINGS D-000-C-0084 TO 0089.

0 20' 50' 100' 200'
1"=100'-0"

WORK SAFELY

REV	DDMMMYY	REVISION / ISSUE DESCRIPTION	DRN	CHK	APP	APP	APP	APP
D	26AUG15	ISSUED FOR INFORMATION	AFK	MTG	DRE	HRM	JCG	
C	03MAR15	ISSUED FOR PERMIT REVIEW; ADDED CDFW JURISDICTIONAL WATERS	JTW	LEC	DRE	HRM	JCG	
B	24FEB15	ISSUED FOR PERMIT REVIEW	JCS	LEC	DRE	HRM	JCG	
A	12JAN15	ISSUED FOR BID	JCS	MTG	LEC	HRM	JCG	

REF	NUMBER	TITLE
REFERENCES		

STAMP/SEAL

APPROVED FOR INFORMATION

CLIENT PROJECT MGR.	DEPARTMENT MGR.	PROJECT MGR.
	DRE	HRM

PROJECT PHASE
PANOCHE VALLEY SOLAR PROJECT

PANOCHE VALLEY SOLAR LLC

amec

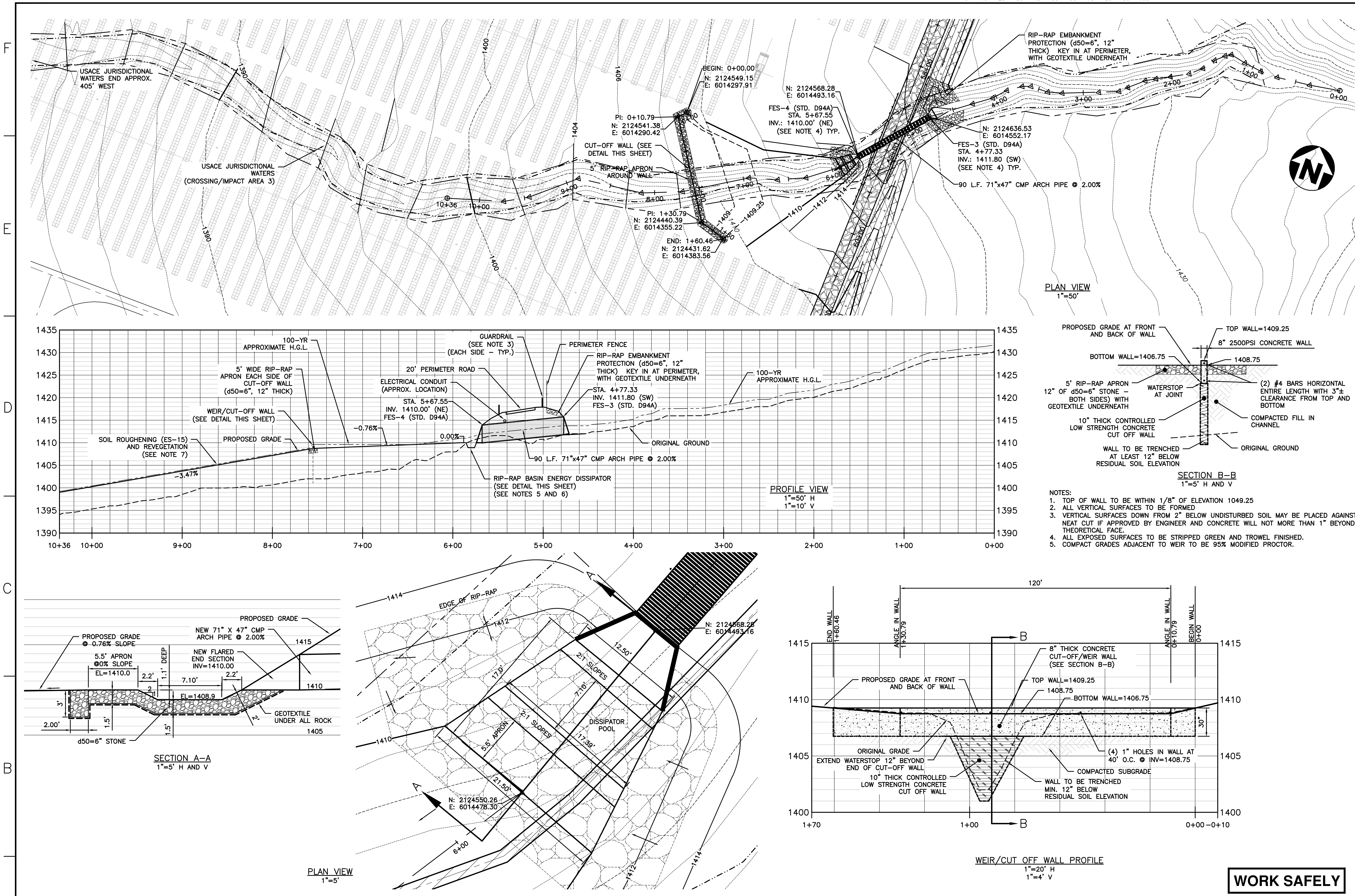
PROJECT NO.	ACTIVITY NO.		BY	DDMMMYY
176055		DES	JCS	03JUN14
		DRN	JCS	03JUN14
SCALE	PACKAGE CODE	CHK	MTG	12JAN15
AS SHOWN		APP	LEC	12JAN15

SUBJECT
CIVIL
PERIMETER ROAD
PLAN AND PROFILE
WEST SIDE

AREA

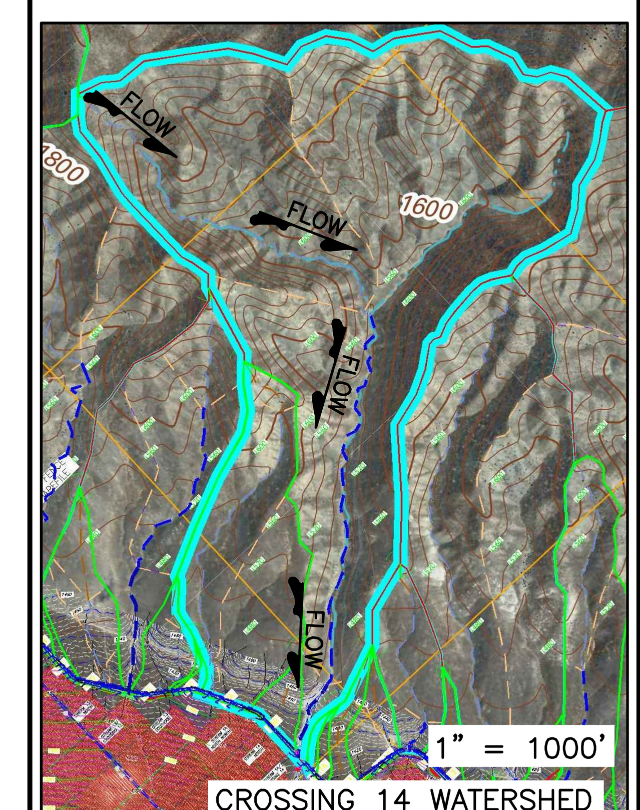
CLIENT DWG. NO.

DRAWING NO. D-000-C-0139 REV. D

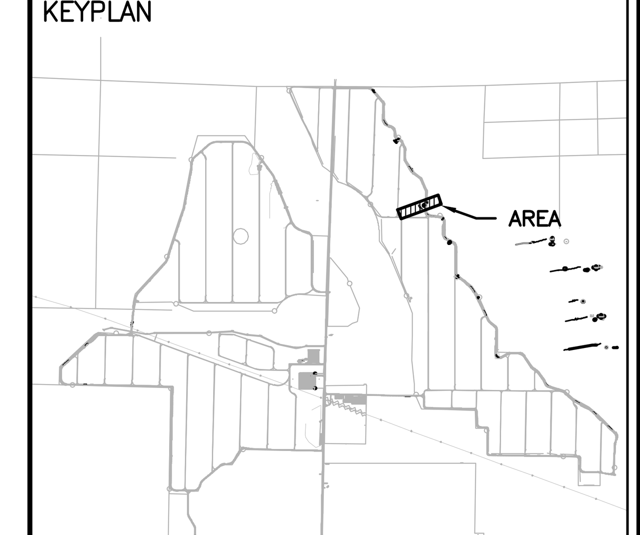


NOTES:
1. TOP OF WALL TO BE WITHIN 1/8" OF ELEVATION 1049.25
2. ALL VERTICAL SURFACES TO BE FORMED
3. VERTICAL SURFACES DOWN FROM 2" BELOW UNDISTURBED SOIL MAY BE PLACED AGAINST NEAT CUT IF APPROVED BY ENGINEER AND CONCRETE WILL NOT MORE THAN 1" BEYOND THEORETICAL FACE.
4. ALL EXPOSED SURFACES TO BE STRIPPED GREEN AND TROWEL FINISHED.
5. COMPACT GRADES ADJACENT TO WEIR TO BE 95% MODIFIED PROCTOR.

NOTES
1. FOR GENERAL NOTES SEE DRAWING D-000-C-0002.
2. ALL CONTRACTORS SHALL ADEHERE TO AND FOLLOW RULES AND GUIDELINES SET FORTH WITHIN THE LAKE AND STREAMBED ALTERATION AGREEMENT NOTIFICATION NO. XXXX-XXXX-XXXX-XX, ISSUED BY THE CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE.
3. GUARDRAIL SHALL BE MIDWEST GUARDRAIL SYSTEM STANDARD RAILING SECTION (STEEL POST WITH NOTCHED WOOD OR NOTCHED RECYCLED PLASTIC BLOCK) IN ACCORDANCE WITH STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION STANDARDS. SEE DWG. D-000-C-0087.
4. THE FLARED END SECTION, FES, OF THE CMP PIPE ARCH SHALL BE TYPE III IN ACCORDANCE WITH CALIFORNIA DEPARTMENT OF TRANSPORTATION STANDARD, D94A. SEE DWG. D-000-C-0086.
5. HYDRAULIC ANALYSIS OF THE CMP PIPE ARCH AND RIP RAP BASIN ENERGY DISSIPATOR COMPLETED WITH THE USE OF THE FEDERAL HIGHWAY ADMINISTRATION PROVIDED SOFTWARE, HY-8 VERSION 7.30.
6. THE RIP RAP BASIN ENERGY DISSIPATOR IS DESIGNED IN ACCORDANCE WITH HYDROLOGIC ENGINEERING CIRCULAR, HEC 14, CHAPTER 10, SECTION 10.1 RIP RAP BASIN.
7. RE-VEGETATION OF THE BACKFILLED EXISTING CHANNEL IS PARAMOUNT. CONTRACTOR SHALL ENSURE THAT AREA OF BACKFILL HAS A GOOD STAND OF VEGETATION. RE-VEGETATION OF THE OPEN SPACE JUST DOWN STREAM OF THE PROPOSED WEIR SHALL ALSO BE OF A GOOD VEGETATED STAND. CONTRACTOR AND OPERATIONS AND MAINTENANCE SHALL NOT MOW THE OPEN AREA DOWNSTREAM OF THE WEIR UNLESS OTHERWISE DIRECTED BY CALFIRE OR THE LOCAL AUTHORITIES.
8. FOR AREAS AND VOLUMES OF CIVIL SITE DEVELOPMENT WORK WITHIN THE FULL EXTENTS OF THE USACE OHWM AND WITHIN THE TOP OF BANK PLEASE REFER TO THE 404(b)(1) DECEMBER 2014.
9. CROSSING 14 HYDROLOGY CONSISTS OF THE FOLLOWING TO THE CMP PIPE ARCH
   - DRAINAGE AREA = 208.1 ACRES
   - CONSISTS OF THREE SUB-BASINS AT 32.5, 2.8, AND 172.8 ACRES
   - COMPOSITE CN = 69
     i. SOILS CONSISTS OF HYDRAULIC SOIL GROUPS A&B
   - TIME OF CONCENTRATION = 18.4 min.
     i. TIME OF REACH = 2.5 min.
   - PEAK FLOW RATE DETERMINED BY SCS METHOD, TIME INTERVAL 2 min. STORM DISTRIBUTION, TYPE 1
   - 100-YR PEAK FLOW RATE = 62.71 CFS
10. BROAD CRESTED WEIR HYDRAULIC INFORMATION CONSISTS OF THE FOLLOWING, VALUES, IN ACCORDANCE WITH THE 100 YR FLOW RATE + 2.29 CFS TO ACCOUNT FOR ADDITIONAL RUNOFF DOWNSTREAM FROM CMP PIPE ARCH;
   - FLOW RATE FOR WEIR CALCULATIONS = 65 CFS
   - BROAD CRESTED WEIR COEFFICENT, C = 2.78
   - FLOW DEPTH JUST UPSTREAM AND ABOVE TOP OF WEIR, H = 0.33'
   - CRITICAL FLOW DEPTH ALONG BROAD CRESTED WEIR, dC = 0.20'
   - BRINK FLOW DEPTH ALONG BROAD CRESTED WEIR JUST PRIOR TO NAPPE, dB = 0.14'
   - HORIZONTAL LENGTH OF NAPPE FROM BROAD CRESTED WEIR = 0.28'
11. FLOW DEPTHS DOWNSTREAM OF BROAD CRESTED WEIR ≤ 0.2' AT Q = 65 CFS, V ≤ 2.0 FT/S



KEYPLAN



N.T.S.

REV	DDMMMYY	REVISION / ISSUE DESCRIPTION	DRN	CHK	APP	APP	APP
C	24FEB15	ISSUED FOR PERMIT REVIEW	JCS	LEC	DRE	HRM	JCG
B	12JAN14	ISSUED FOR BID	JCS	MTG	LEC	HRM	JCG
A	11DEC14	ISSUED FOR INFORMATION	JCS	MBE			

REF | NUMBER | TITLE — REFERENCES

STAMP/SEAL

APPROVED FOR PERMIT REVIEW

DRE — HRM

CLIENT PROJECT MGR. | DEPARTMENT MGR. | PROJECT MGR.

PROJECT PHASE: PANOCHE VALLEY SOLAR PROJECT

PANOCHE VALLEY SOLAR LLC

amec

PROJECT NO.	ACTIVITY NO.		BY	DDMMMYY
176055		DES	MTG	01JUL14
SCALE	PACKAGE CODE	DRN	JCS	01JUL14
AS SHOWN		CHK	MTG	12JAN15
		APP	LEC	12JAN15

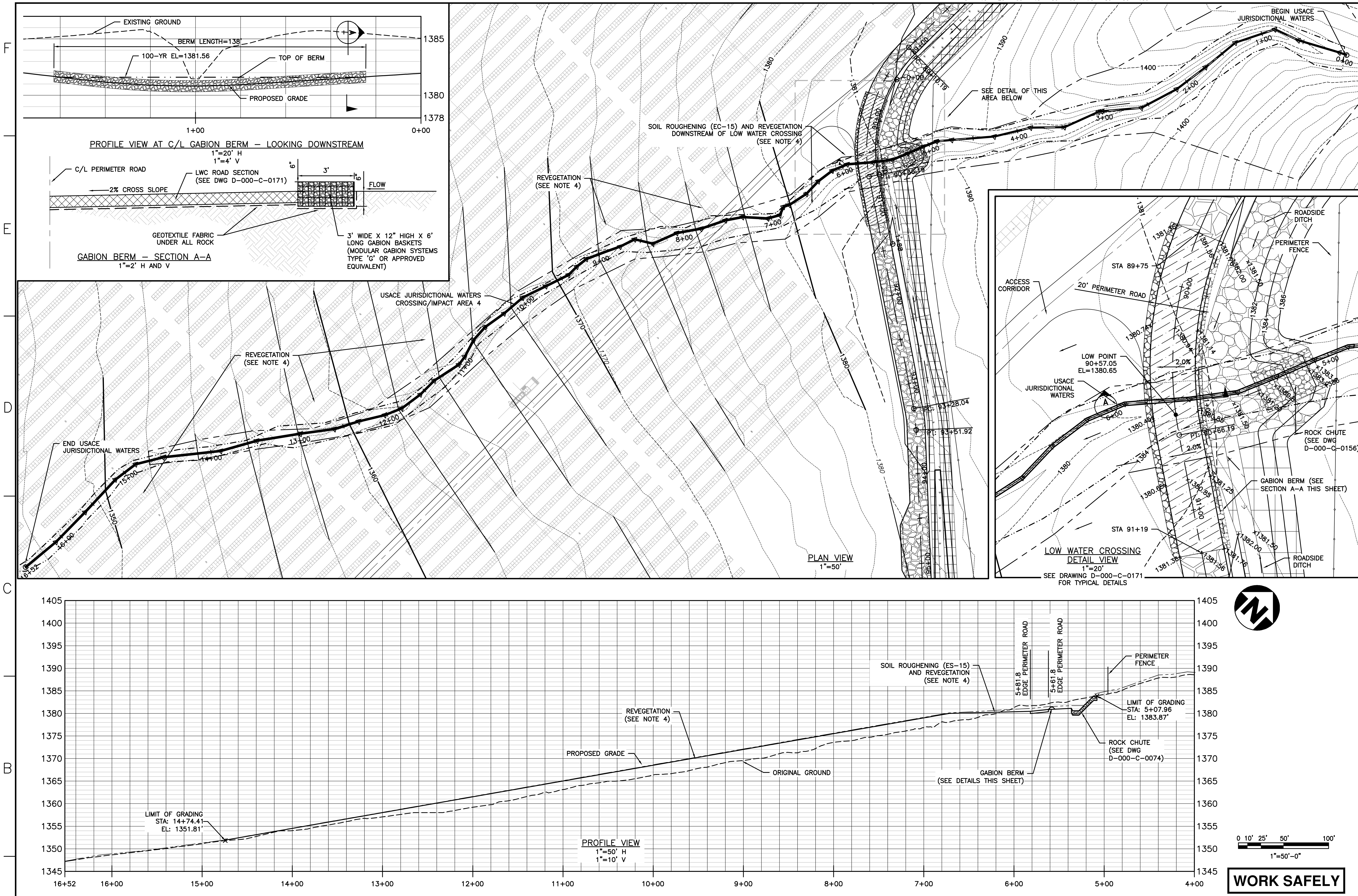
SUBJECT: CIVIL PERIMETER ROAD DETAILS CROSSING 14

AREA

CLIENT DWG. NO.

DRAWING NO. D-000-C-0155 REV. C

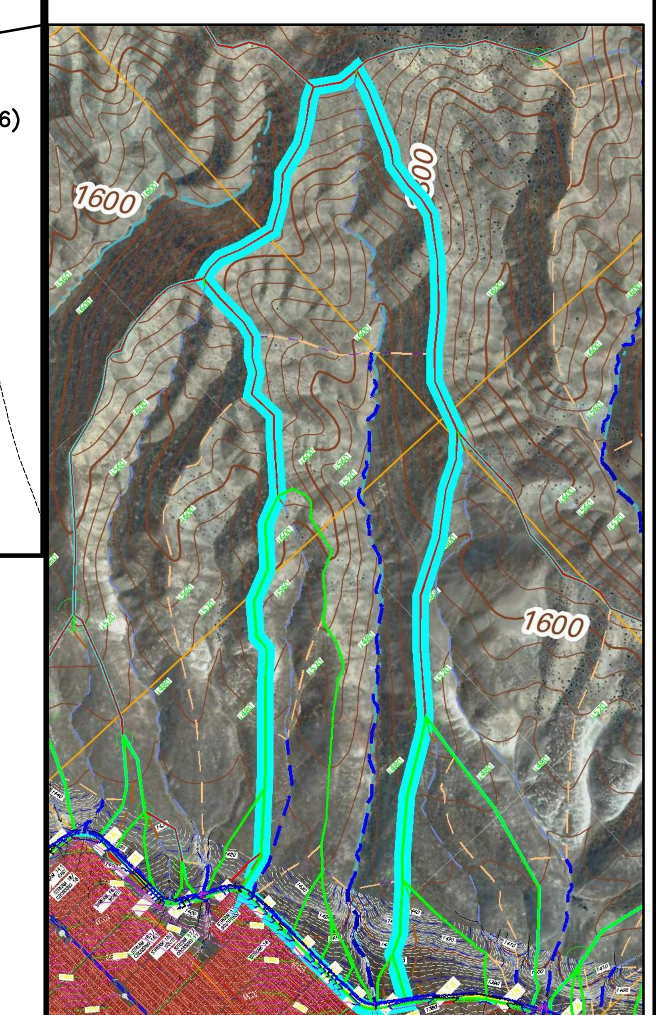
SAVED: 24-Feb-15 8:47 AM PLOTTED: 24-Feb-15 3:34 PM USER: STEADHAM, CHARLES
CAD FILE: P:\CAD\CIV\D-000-C-0154 - 0160.DWG



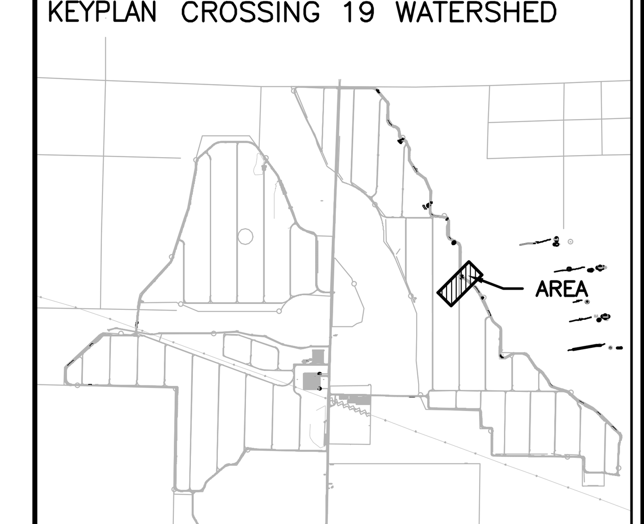
WORK SAFELY

NOTES

1. FOR GENERAL NOTES SEE DRAWING D-000-C-0002.
2. ALL CONTRACTORS SHALL ADEHERE TO AND FOLLOW RULES AND GUIDELINES SET FORTH WITHIN THE LAKE AND STREAMBED ALTERATION AGREEMENT NOTIFICATION NO. XXXX-XXXX-XXXX-XX, ISSUED BY THE CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE.
3. HYDRAULIC ANALYSIS OF THE ROCK LINED LOW WATER CROSSING IS DESIGNED IN ACCORDANCE WITH THE HYDROLOGIC ENGIINEERING CIRCULAR, HEC 15, CHAPTER 6, RIP RAP, COBBLE, AND GRAVEL LINING DESIGN AND USDA FOREST SERVICE TECHNICAL MANUAL.
4. RE-VEGETATION OF THE BACKFILLED EXISTING CHANNEL IS PARAMOUNT. CONTRACTOR SHALL ENSURE THAT AREA OF BACKFILL HAS A GOOD STAND OF VEGETATION. RE-VEGETATION OF THE OPEN SPACE JUST DOWN STREAM OF THE LOW WATER CROSSING SHALL ALSO BE OF A GOOD VEGETATED STAND. CONTRACTOR AND OPERATIONS AND MAINTENANCE SHALL NOT MOW THE OPEN AREA DOWNSTREAM OF THE LOW WATER CROSSING UNLESS OTHERWISE DIRECTED BY CALFIRE OR THE LOCAL AUTHORITIES.
5. FOR AREAS AND VOLUMES OF CIVIL SITE DEVELOPMENT WORK WITHIN THE FULL EXTENTS OF THE USACE OHWM AND WITHIN THE TOP OF BANK PLEASE REFER TO THE 404(b)(1) DECEMBER 2014.
6. CROSSING 19 HYDROLOGY CONSISTS OF THE FOLLOWING TO THE CMP PIPE ARCH
   - DRAINAGE AREA = 114.5 ACRES
   - CONSISTS OF THREE SUB-BASINS AT 25.4, 0.8, AND 88.3 ACRES
   - COMPOSITE CN = 71, SOILS CONSISTS OF HYDRAULIC SOIL GROUPS A&B
   - TIME OF CONCENTRATION = 14.6 min.
   - PEAK FLOW RATE DETERMINED BY SCS METHOD, TIME INTERVAL 1 min. STORM DISTRIBUTION, TYPE 1
7. FLOW DEPTHS AT OUTLET OF ROCK CHUTE ≤ 0.18' AT Q =35.58 CFS, V ≤ 1.53 FT/S
8. BROAD CRESTED WEIR HYDRAULIC CALCULATIONS FOR THE SMALL ROCK BERM CONSISTS OF THE FOLLOWING, VALUES, IN ACCORDANCE WITH THE 100 YR FLOW RATE ;
   - FLOW RATE FOR WEIR CALCULATIONS = 35.58 CFS
   - BROAD CRESTED WEIR COEFFICENT, C = 2.72
   - FLOW DEPTH JUST UPSTREAM AND ABOVE TOP OF WEIR, H = 0.21'
   - CRITICAL FLOW D. AT BROADCRESTED WEIR, dC = 0.15'
   - BRINK FLOW DEPTH ALONG BROAD CRESTED WEIR JUST PRIOR TO NAPPE, dB = 0.11'
   - HORIZONTAL LENGTH OF NAPPE FROM BROAD CRESTED WEIR = 0.24'
   - VELOCITY ACROSS THE WEIR IS AT 1.35 FT/S
9. FLOW DEPTHS ACROSS THE ROCK LOW WATER CROSSING ≤ 0.63' AT Q = 35.58 CFS, V ≤ 1.39 FT/S



KEYPLAN CROSSING 19 WATERSHED



N.T.S.

REV	DDMMMYY	REVISION / ISSUE DESCRIPTION	DRN	CHK	APP	APP	APP	APP
D	24FEB15	ISSUED FOR PERMIT REVIEW	JCS	LEC	DRE	HRM	JCG	
C	30JAN15	REVISED FOR BID	JCS	MTG	LEC	HRM	JCG	
B	12JAN14	ISSUED FOR BID	JCS	MTG	LEC	HRM	JCG	
A	11DEC14	ISSUED FOR INFORMATION	JCS	MBE				

REF	NUMBER	TITLE
REFERENCES		

STAMP/SEAL

APPROVED FOR PERMIT REVIEW

CLIENT PROJECT MGR.	DEPARTMENT MGR.	PROJECT MGR.
	DRE	HRM

PROJECT PHASE: PANOCHE VALLEY SOLAR PROJECT

PANOCHE VALLEY SOLAR LLC

amec

PROJECT NO.	ACTIVITY NO.		BY	DDMMMYY
176055		DES	MTG	01JUL14
SCALE	PACKAGE CODE	DRN	JCS	01JUL14
AS SHOWN		CHK	MTG	12JAN15
		APP	LEC	12JAN15

SUBJECT: CIVIL PERIMETER ROAD DETAILS CROSSING 19

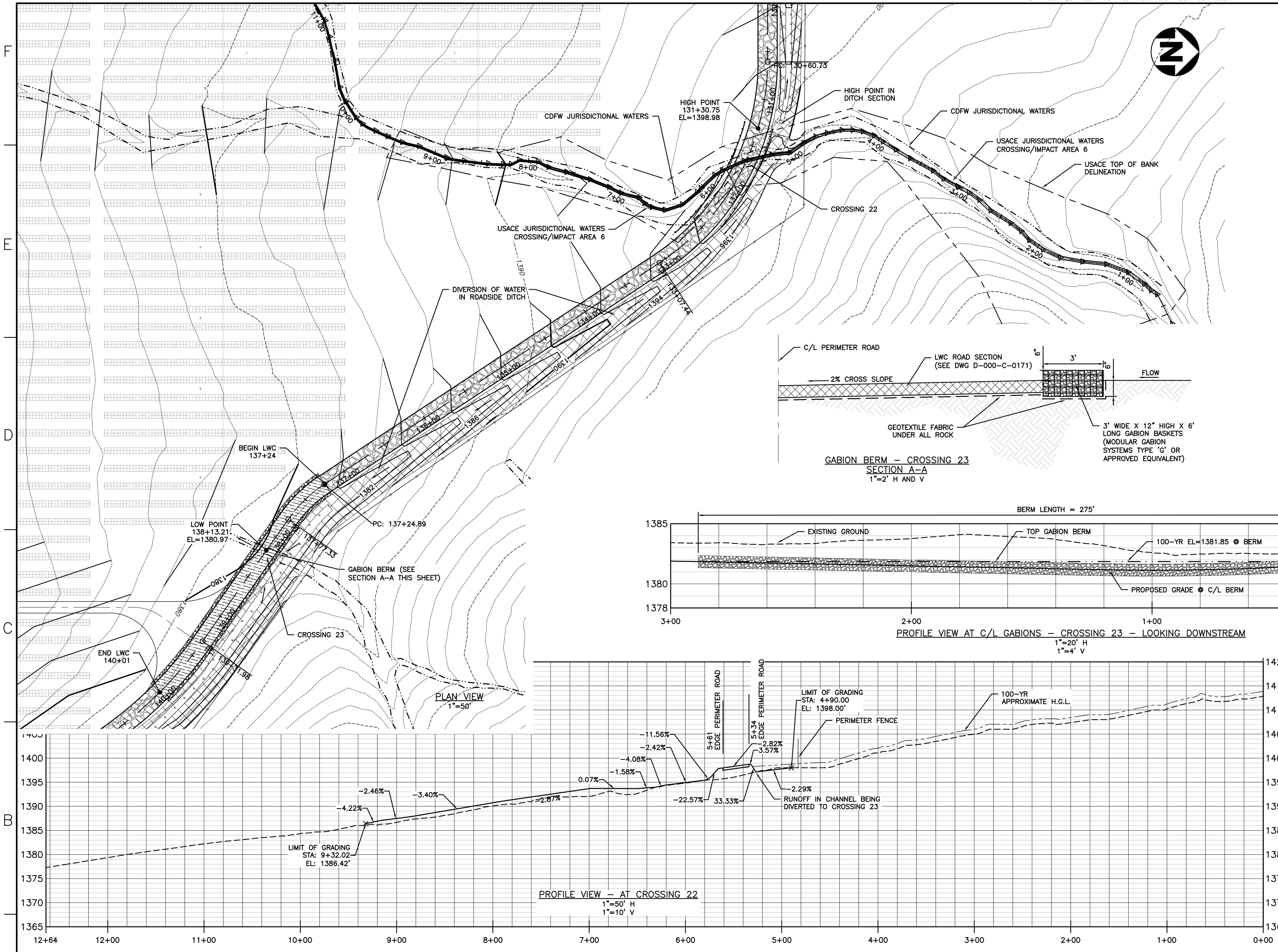
AREA

CLIENT DWG. NO.

DRAWING NO. D-000-C-0158 REV. D

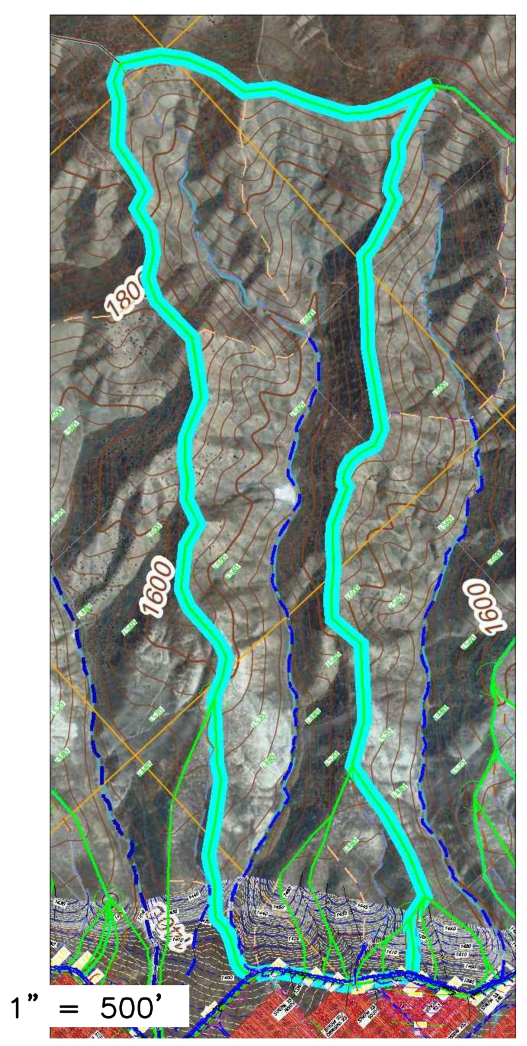
SAVED: 23-Feb-15 8:56 PM PLOTTED: 24-Feb-15 8:26 AM USER: STEADHAM, CHARLES

CAD FILE: P:\CAD\CIV\D-000-C-0154 – 0160.DWG



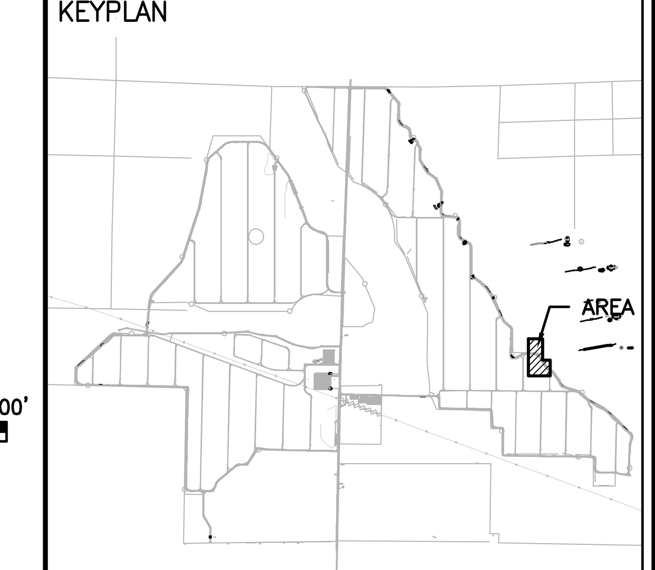
NOTES

1. FOR GENERAL NOTES SEE DRAWING D-000-C-0002.
2. ALL CONTRACTORS SHALL ADEHERE TO AND FOLLOW RULES AND GUIDELINES SET FORTH WITHIN THE LAKE AND STREAMBED ALTERATION AGREEMENT NOTIFICATION NO. XXXX-XXXX-XXXX-XX, ISSUED BY THE CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE.
3. HYDRAULIC ANALYSIS OF THE ROCK LINED LOW WATER CROSSING IS DESIGNED IN ACCORDANCE WITH THE HYDROLOGIC ENGINEERING CIRCULAR, HEC 15, CHAPTER 6, RIP RAP, COBBLE, AND GRAVEL LINING DESIGN AND USDA FOREST SERVICE TECHNICAL MANUAL.
4. RE-VEGETATION OF THE BACKFILLED EXISTING CHANNEL IS PARAMOUNT. CONTRACTOR SHALL ENSURE THAT AREA OF BACKFILL HAS A GOOD STAND OF VEGETATION. RE-VEGETATION OF THE OPEN SPACE JUST DOWN STREAM OF THE LOW WATER CROSSING SHALL ALSO BE OF A GOOD VEGETATED STAND. CONTRACTOR AND OPERATIONS AND MAINTENANCE SHALL NOT MOW THE OPEN AREA DOWNSTREAM OF THE LOW WATER CROSSING UNLESS OTHERWISE DIRECTED BY CALFIRE OR THE LOCAL AUTHORITIES.
5. FOR AREAS AND VOLUMES OF CIVIL SITE DEVELOPMENT WORK WITHIN THE FULL EXTENTS OF THE USACE OHWM AND WITHIN THE TOP OF BANK PLEASE REFER TO THE 404(b)(1) DECEMBER 2014.
6. CROSSING 22&23 HYDROLOGY CONSISTS OF THE FOLLOWING TO THE LOW WATER CROSSING
   - DRAINAGE AREA = 164.29 ACRES
   - CONSISTS OF THREE SUB-BASINS AT 149.05, 2.06, AND 13.18 ACRES
   - COMPOSITE CN = 72, SOILS CONSISTS OF HYDRAULIC SOIL GROUPS A&B&D
   - TIME OF CONCENTRATION = 19.6 min.
   - PEAK FLOW RATE DETERMINED BY SCS METHOD, TIME INTERVAL 1 min. STORM DISTRIBUTION, TYPE 1
   - 100-YR PEAK FLOW RATE = 49.62 CFS
7. BROAD CRESTED WEIR HYDRAULIC CALCULATIONS FOR THE SMALL ROCK BERM CONSISTS OF THE FOLLOWING, VALUES, IN ACCORDANCE WITH THE 100 YR FLOW RATE ;
   - FLOW RATE FOR WEIR CALCULATIONS = 49.62 CFS
   - BROAD CRESTED WEIR COEFFICENT, C = 2.72
   - FLOW DEPTH JUST UPSTREAM AND ABOVE TOP OF WEIR, H = 0.18'
   - CRITICAL FLOW D. AT BROADCRESTED WEIR, dC = 0.11'
   - BRINK FLOW DEPTH ALONG BROAD CRESTED WEIR JUST PRIOR TO NAPPE, dB = 0.08'
   - HORIZONTAL LENGTH OF NAPPE FROM BROAD CRESTED WEIR = 0.20'
   - VELOCITY ACROSS THE WEIR IS AT 1.11 FT/S
8. FLOW DEPTHS ACROSS THE ROCK LOW WATER CROSSING ≤ 0.38' AT Q = 49.62 CFS, V ≤ 1.3 FT/S



CROSSING 22 & 23 WATERSHED

KEYPLAN



1"=50'-0"

WORK SAFELY

REV	DDMMMYY	REVISION / ISSUE DESCRIPTION	DRN	CHK	APP	APP	APP	APP
D	24FEB15	ISSUED FOR PERMIT REVIEW	JCS	LEC	DRE	HRM	JCG	
C	30JAN15	REVISED FOR BID	JCS	MTG	LEC	HRM	JCG	
B	12JAN14	ISSUED FOR BID	JCS	MTG	LEC	HRM	JCG	
A	11DEC14	ISSUED FOR INFORMATION	JCS	MBE				

REF	NUMBER	TITLE
	REFERENCES	

STAMP/SEAL

APPROVED FOR PERMIT REVIEW

	DRE	HRM
CLIENT PROJECT MGR.	DEPARTMENT MGR.	PROJECT MGR.

PROJECT PHASE
PANOCHE VALLEY SOLAR PROJECT

PANOCHE VALLEY SOLAR LLC

amec

PROJECT NO.	ACTIVITY NO.		BY	DDMMMYY
176055		DES	MTG	01JUL14
SCALE	PACKAGE CODE	DRN	JCS	01JUL14
AS SHOWN		CHK	MTG	12JAN15
		APP	LEC	12JAN15

SUBJECT
CIVIL
PERIMETER ROAD DETAILS
CROSSING 22 AND 23

AREA

CLIENT DWG. NO.

DRAWING NO. D-000-C-0160

REV. D

CAD FILE: P:\CAD\CIV\D-000-C-0154 – 0160.DWG
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